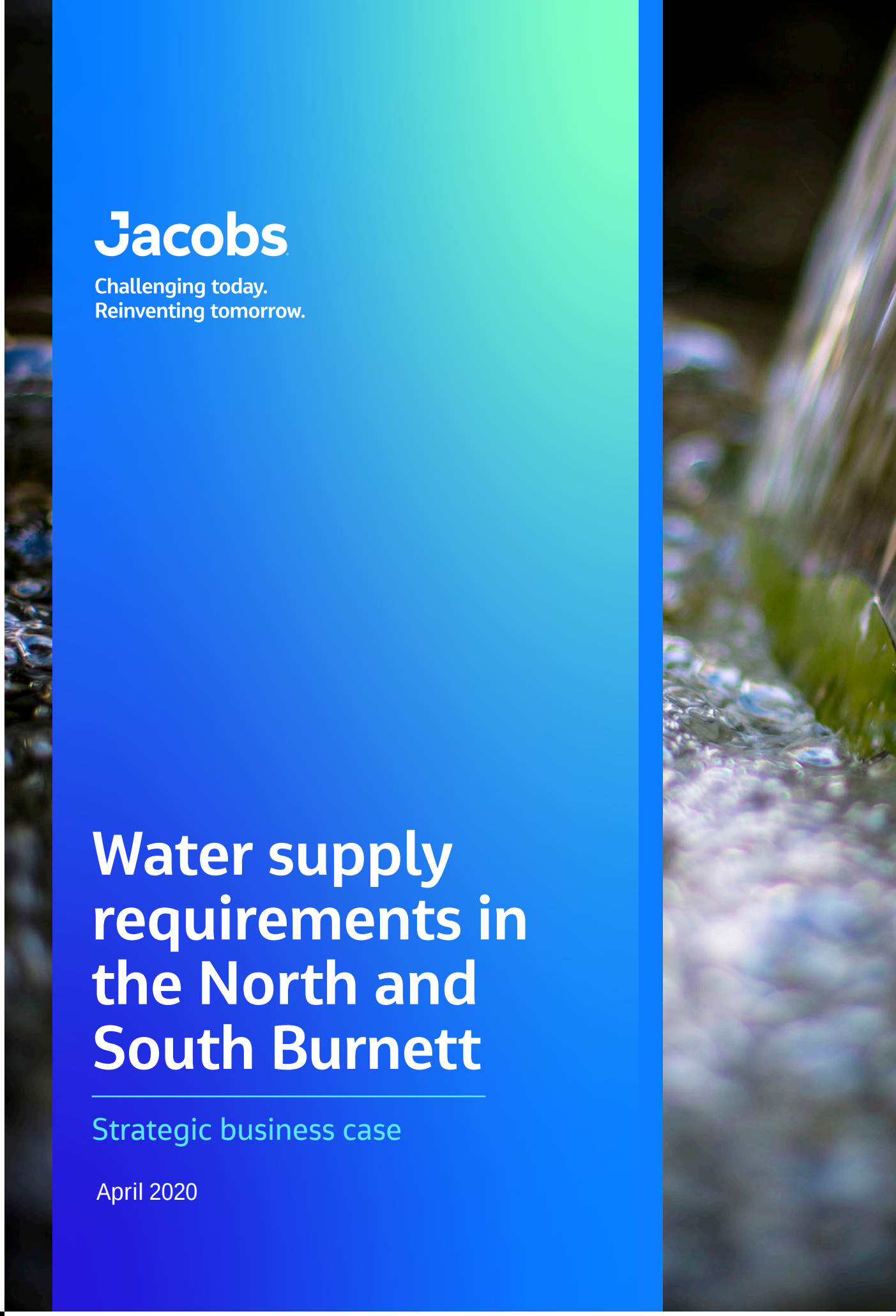


Jacobs

Challenging today.
Reinventing tomorrow.

# Water supply requirements in the North and South Burnett

## Strategic business case

April 2020

# Water supply requirements in the North and South Burnett

| | |
|---|---|
| Project No: | IS310200 |
| Document Title: | Strategic Business Case |
| Document No.: | 1 |
| Revision: | B |
| Document Status: | Final |
| Date: | 15 April 2020 |
| Client Name: | DNRME |
| Client No: | |
| Project Manager: | Matthew Bradbury |
| Author: | Angus MacDonald, Duncan Maclaine, Cameron Smith, Chris Hewitt and Tom Vanderbyl |
| File Name: | v40 - FINAL North and South Burnett Strategic Business Case - 15 April 2020 |

Jacobs Australia Pty Limited

32 Cordelia Street
PO Box 3848
South Brisbane QLD 4101 Australia
T +61 7 3026 7100
F +61 7 3026 7300
www.jacobs.com



## Document history and status

| Revision | Date | Description | Authors | Reviewers | Approved |
|---|---|---|---|---|---|
| 1A | 1 March 2020 | Draft | Cameron Smith, Chris Hewitt, Duncan Maclaine, Sebastian Vanderzeil and Tom Vanderbyl | Matt Bradbury and Angus MacDonald | Matt Bradbury |
| 1B | 15 April 2020 | Final | Cameron Smith, Chris Hewitt, Duncan Maclaine, Sebastian Vanderzeil and Tom Vanderbyl | Matt Bradbury and Angus MacDonald | Matt Bradbury |

## Contents

# Glossary

| | |
|---|---|
| **AA** | Announced Allocation |
| **BIEDO** | Burnett Inland Economic Development Organisation |
| **BIA** | Bundaberg Irrigation Area |
| **BRC** | Bundaberg Regional Council |
| **BRI** | Boyne River Irrigators |
| **BRIA** | Boyne River Irrigation Area |
| **BRIAC** | Boyne River Irrigator Advisory Committee |
| **BWSS** | Bundaberg Water Supply Scheme |
| **EIS** | Environmental Impact Statement |
| **IAC** | (Sunwater) Irrigation Advisory Committees |
| **IWSC** | Irrigation and Water Supply Commission |
| **PHES** | Pumped Hydro Energy Storage |
| **KSC** | Kingaroy Shire Council |
| **LGAQ** | Local Government Association of Queensland |
| **NBRC** | North Burnett Regional Council |
| **NSC** | Nanango Shire Council |
| **NSP** | Network Service Plan |
| **NWIDF** | National Water Infrastructure Fund |
| **QBWOS** | Queensland Bulk Water Opportunities Statement |
| **QEGB** | Queensland Electricity Generation Board |
| **RECE** | Rural Economies Centre of Excellence |
| **RoR** | Rate of Return |
| **SANBAS** | South and North Burnett Regional Agricultural Sub-Region |
| **SWASB** | Sustainable Water Alternatives for the South Burnett Group |
| **TPS** | Tarong Power Station |
| **WBBR** | Wide Bay Burnett Region |
| **WBBROC** | Wide Bay Burnett Region Organisation of Councils |

# Executive summary

There is a real and present need to improve the reliability and security of water in the North and South Burnett region to strengthen and expand agricultural and industrial activity as well as ensure water security for urban users. These improvements have the ability to generate material benefits for the economic and social lives of present and future residents in the region and the State of Queensland.

The specific benefits of these improvements to reliability and security include:

- Sustained increases in agricultural production
- Growth of agricultural exports for a wide range of high value crops grown in the region
- Improved economic resilience through a stronger agricultural sector
- Improved community resilience through improved urban and industrial water security.

In particular, the region has under-utilised high quality soils with significant agricultural production potential for domestic and international markets. Projects to increase irrigated agriculture production in existing and new agricultural areas across the region will have a positive impact on the region.

North Burnet irrigated agricultural production includes mandarins, limes, lemons and blueberries while the South Burnett irrigated agriculture is primarily broadacre, cereal crops and hay. In 2019, irrigated agriculture in the region generated approximately 40% of the $394 million of agricultural value in North Burnett and approximately 20% of the $346 million in the South Burnett. Both of these figures are slightly lower than the historical average due to lower water availability. The overall trend of agricultural value in the region is flat to falling.

In the absence of change, South Burnett is likely to continue to experience high unemployment as local employment is dependent on the agricultural sector. The population in North Burnett is in long-term decline, driven in part by a lack of economic opportunities and urban water security issues, and increased agricultural production along with improved urban water security may reverse this trend. The strong link between employment and agriculture in the region which means that a weak agricultural sector results in weak regional employment.

These employment and population issues are already leading to higher socio-economic disadvantage within the region compared with the rest of Queensland and Australia. Several towns such as Nanango and Kingaroy North are ranked in the top quartile of the State's 513 Statistical Local Areas (SLAs) for socio-economic disadvantage. In addition, the low urban water security of regional centres in South Burnett impose further hardship on residents and businesses with urban centres such as Kingaroy experiencing substantial water insecurity.

This strategic business case forms part of an Australian Government-funded feasibility study to examine a range of options that increase water supply and security and deliver new jobs and economic growth in the North and South Burnett region of Queensland – collectively the Burnett Region.

The Australian Government's National Water Infrastructure Development Fund (NWIDF) grant for this study is administered by the Queensland Department of Natural Resources Mines and Energy (DNRME). This strategic business case represents the first phase and will be followed by a preliminary business case which is informed by the recommendations of this report. The final stage will be detailed business cases on the preferred options.

Within the North and South Burnett, the key Sunwater-run water supply schemes are:

- Boyne River and Tarong Water Supply Scheme supplied by Boondooma Dam
- Barker Barambah Water Supply Scheme supplied by the Bjelke-Petersen Dam. The dam is near Moffatdale in the South Burnett. It captures the flows of Barker, Four Mile, Six Mile, Frickey and Cattle creeks.
- Bundaberg Water Supply Scheme which sources water from Fred Haigh and Paradise Dam
- Upper Burnett Water Supply Scheme supplied by Wuruma Dam, John Goleby, Jones, Kirar and Claude Wharton weirs. Water is supplied to customers along 165 km of the Burnett River to Mingo crossing.

- Three Moon Creek Water Supply Scheme draws its water from Cania Dam and provides irrigation and urban water supply to users in Monto and Mulgildie.

Water in the Burnett River basin is allocated and managed under the Water Plan (Burnett Basin) 2014. This effectively caps the total volume of water that may be allocated in the basin i.e. existing water entitlements plus new entitlements that relate to planning provisions including additional volumes of unallocated water reserves specified in the water plan. It also effectively specifies the minimum long-term reliability for each priority group of water allocations.

Firstly, an introduction to the key terms water of *reliability* and *security*.

Water *reliability* refers to the portion of time that water demands can be met. It is usually specified in terms of the percentage of months (or, alternatively, years) of a defined historical period (usually 100 or more years) that a specific volume of monthly (or annual) customer water demands that are likely to be fully met by the volume of water available to that customer through the relevant water sharing rules (e.g. through distinguishing between medium and high priority announced allocations).

Water *security* relates to the levels of service that might be expected from a water supply scheme when its surface water reserves become critically low. It is usually specified in terms of the frequency, duration and intensity of water restrictions that might be expected as a result of the long-term hydrologic risk of drought conditions occurring. Security is a concept applied particularly to urban and industrial water during periods of extreme drought and is used in planning for the water infrastructure requirements of urban centres and high priority water users. High value permanent plantings in agriculture may also be focussed on water security.

The Burnett region has good and very good quality soil for agriculture. Individual soil types are assigned to one of five suitability classes for agriculture, ranging from class 1 (highly suitable) to class 5 (unsuitable), depending on the extent to which limitations are present. Because of the coarse nature of this mapping, most classified areas contain a mix of classes the specific extent and location of which is unknown until further on ground assessment.

- The North Burnett has 195,406 hectares of at least class 2 and 152,900 hectares of class 3 soil. The very good quality (potentially class 1) soil is around Coalstoun Lakes, Boyne / Mundubbera and St John Creek.
- The South Burnett has 245,819 hectares of at least class 2 and 87,971 hectares of class 3 soil[1]. There is a long stretch of at least class 2 soil that runs along the West of Barker and Barambah creeks.

Several small specific studies have been undertaken to identify class 1 soil (some of which is already irrigated), which requires more detailed mapping. These studies identified 3,800 hectares around Kingaroy, 6,000 hectares between Munduberra and Gayndah and 4,000 hectares in Coalstoun Lakes (50 per cent of the studied soil).

Across the region, approximately 14,000-36,000 hectares are currently used for irrigation, leaving over 600,000 hectares of at least class 2 (incl. some class 1) and class 3 soil available for irrigation. Funding would be required to map this with higher certainty, including to identify the areas of class 1 soils within those mapped as class 2.

Crops grown in the area, and crops that could be grown on the available soil with additional water, are high value. The area produces high economic returns to the State. The export potential for additional agriculture is strong.

In the North Burnett, agriculture is the dominant employer with employed people in the North Burnett 11 times more likely to be employed in Agriculture, Forestry and Fishing than Queensland as a whole. However, between 2006 and 2016, the number of employed people has decreased by 1.7 per cent per year. While South Burnett has a more diversified local economy with employment in the utilities sector (Tarong Power Station), health and mining, agriculture is still the major employer and source of economic value so employment and population growth in the region is highly dependent on the agricultural sector.

[1] *Class 2 is Suitable land with minor limitations and Class 3is Suitable land with moderate limitations.*

Tarong Power Station, located in South Burnett, is a key regional power asset and employer in the region that requires high security water allocations for its operations. The 1,400M coal-fired power station has access to Boondooma Dam and Wivenhoe Dam via pipelines. Maintaining appropriate water security for the life of this asset is a critical component any set of options to improve reliability and security in the region.

In addition, a number of urban centres in South Burnett are experiencing low water security and are on Level 3 water restrictions including Kingaroy, Kumbia, Wooroolin, Nanango, Blackbutt, Wondai Tingoora, Proston and Proston Rural, and Murgon. Level 3 targets 160 litres per person per day by restricting a number of urban and commercial water uses as well as water use times and days. Kingaroy has a modelled recurrence interval of not being able to meet demand one year in four without an increase in supply.

Other key water issues identified for these schemes include:

- In the Boyne River and Tarong Water Supply Scheme:
  - A 70,000ML cut-off rule is in place in the Boondooma Dam to ensure adequate water supply for the critical Tarong Power Station and urban users in the region. This rule cuts off other users from accessing the dam when the volume of water in the storage goes below this level. An impact of the rule is that irrigators with medium-priority water allocations in this scheme are regularly cut-off from accessing water from the dam. Since 2002, the Dam has been below the cut-off volume for 19 per cent of the time. During these periods, irrigators are restricted to limited water supplies from downstream bedsands and water holes. Irrigators raised concerns about whether the cut-off rule represents the optimal method of allocating water from this storage while maintaining appropriate water security for critical users such as the power station and urban customers.
  - Boondooma Dam is towards the top of the Boyne River catchment and it can take up to ten days for water to travel from the dam to the irrigators. This results in inefficient operation of the storage and impacts on the reliability experienced by both urban and rural customers due to the scheme incurring high transmission losses as well as scheme inefficiencies arising from cancelled orders (as it can rain between ordering and delivery). In addition, there are several creeks that flow into the Boyne River downstream of the dam and are, therefore, not captured and stored by this dam but could be captured by new infrastructure.
- In the Barker Barambah scheme, irrigators with medium-priority allocations have had unreliable announced allocations, with several periods of very low, or no water available.

Previous demand assessments in the region (Bundaberg Channel Capacity Upgrade feasibility study and Gayndah Regional Irrigation Development) also identified demand for additional water.

A broader review of 60 existing studies identified three recurring themes for water in the region:

1) The North and South Burnett regions contain significant environmental, climatological and economic advantages for agricultural and industrial enterprises with associated regional economic benefits
2) Improving water reliability and security are critical to these enterprises and the region
3) A range of solutions for the water challenges in North and South Burnett exist, including some low-cost initiatives that focus on better use of existing resources without the need for large-scale investment.

Previous studies documented the economic, environmental and climatological features and advantages of North and South Burnett. *Soils of the Riparian Lands of the Burnett River, 1996* (Appendix A, Document 11) identified a high proportion of land close to the river that is suitable for irrigated cropping, and extensive areas suitable for irrigation some distance from the Burnett River.

The *Agricultural Land Resource Assessment of Coalstoun Lakes, 2000* (Appendix A, Document 30) identified significant areas suitable for expanded agricultural production based on very high soil quality around the Coalstoun Lakes area. Studies also outlined the economic advantages of the region, including proximity to domestic and international markets, existing transport infrastructure and human resources (*Economic Development and Innovation Strategy*: Document 12; *Queensland Regional Profile: South and North Burnett, 2019*: Document 14; *Water Transfer and Hydro Storage Study, 2018*: Document 25; *Barambah Creek Proposal, 2018*: Document 28).

Stakeholder engagement is critical to the development of a robust strategic business case. As part of this strategic business case, 25 different stakeholder entities (individuals and groups) were consulted. The project team conducted multiple field trips to the region (November-December 2019 and February 2020) talking to key stakeholders and visiting farms and potential infrastructure sites. This included visits to Munduberra, Gayndah, Nanango, Kingaroy, Tarong Power Station, Coalstoun Lakes and the Boyne and Barker Barambah schemes.

The stakeholder engagement confirmed many of the findings of previous studies and analysis. A key stakeholder discussion involved concerns about water security for Kingaroy urban and industrial water users.

An Investment Logic Mapping (ILM) approach was adopted to develop a shared understanding and agreement of the service need (problems and opportunities), benefits sought and potential initiatives to address the service needs. The two workshops generated a set of Statements of Service Needs:

- Security of urban water supply is poor and deteriorating, harming community welfare and limiting industrial expansion
- Existing agricultural supplemented water allocations are highly unreliable resulting in reduced agricultural output, jobs and investment
- Large areas of fertile land have no access to a reliable source of water hindering crop yields, values, diversity and the expansion of exports due to dependence on unreliable seasonal rains.

The ILM generated a set of benefits sought. It weighted and ranked these benefits based on participant feedback.

Table 1: Benefit sought ranking and weightings provided by participants

| Rank | North Burnett | South Burnett |
|---|---|---|
| 1 | Sustained increases in agricultural production (50%) | Sustained increases in agricultural production (35%) |
| 2 | Improved economic (agricultural) resilience (35%) | Improved community (urban) resilience (30%) |
| 3 | Emergence of efficient local supply chain industries (15%) | Improved economic (agricultural) resilience (20%) |
| 4 | | Growth of efficient agricultural processing industries (15%) |

Collectively, six strategic responses were identified for North Burnett and South Burnett.

These are the high-level interventions that, if delivered upon, will deliver the benefits sought and solve the identified Statements of Services Needs that were identified in the ILM process.

Table 2: North and South Burnett strategic responses

| North Burnett | South Burnett |
|---|---|
| 1) Optimise water policies and rules to improve water use efficiency, availability and reliability (both areas) | |
| 2) Increase the reliability of existing agricultural water allocations by improving the efficiency and capacity of water storages (north) | 3) Improve efficiency and capacity of water storages to increase the reliability of urban and agricultural water allocations (south) |
| 4) Deliver water to new areas with highly fertile soils (both areas) | |
| 5) Remove general infrastructure barriers and impediments to supply chain expansion (north) | 6) Increase volume of water allocations for urban use by sourcing water from alternative storages including from neighbouring regions (south) |

A set of 15 initiatives were then developed based on the results of the ILM process, stakeholder engagement and the literature review.

Such initiatives included all the identified asset and non-asset solutions that would, at least in part, implement the strategic response and deliver the benefits sought. These initiatives, along with a description and, are provided in the table below. These initiatives are an important output of the strategic business case.

In addition, the initiatives are categorised according to the Queensland Government's State Infrastructure Plan (SIP) and the Queensland Bulk Water Opportunities Statement (QBWOS). QBWOS is the bulk water security strategy and direction statement for the state. It describes how the Queensland Government aims to get the right balance between better using the bulk water infrastructure we already have and committing to new projects.

The SIP and QBWOS articulate a preference for 'reform' and 'better use' solutions over 'build new'.

Most of the potential initiatives identified as part of this strategic business case relate to either 'reform' or 'build new', noting that the build new initiatives presented below reflect generally moderate (not onerous) capital expenditure budgets.

This suggests that, subject to the findings of the subsequent preliminary and detailed business cases, there may be several affordable initiatives available to the region in which the private and public sectors could invest.

Table 3: Identified initiatives

| No | Initiative | State Infrastructure Plan Category | Description |
|---|---|---|---|
| 1 | Reform water sharing rules (including the mitigating/removing 'cut-off' rule) | Reform | Reform water sharing rules that permit the supply of water for irrigation use when Boondooma Dam falls below 70,000 ML. This might require restricting access for irrigation use to some degree when the dam is above 70,000 in order to maintain the performance of urban and industrial users. |
| 2 | Liberalise water allocation trading between and within water supply schemes | Reform | Allow a greater ability to trade water allocations between and within water supply schemes. |
| 3 | Optimise in-scheme unsupplemented access rules | Reform | Optimising in-scheme unsupplemented access rules to cater for greater use of projected water levels when making water harvesting announcements. This will allow greater water security to support expansion of irrigated agriculture. |
| 4 | Increase the size of existing storages | Improve existing | Improve the reliability and security of existing storages by increasing the capacity. Potential solutions for this initiative include raising Boondooma Dam, Claude Wharton Weir and/or Jones Weir. |
| 5 | Construct re-regulating weirs downstream of existing headworks storages | New | Improve the reliability and security of existing storages by constructing re-regulating weirs downstream of existing headworks storages. Potential solutions for this initiative include Cooranga Weir (or another Boyne River site), Auburn River Weir, and/or Barlil Weir. |
| 6 | Build new headworks / off-stream storages | New | Improve the reliability and security of existing storages by constructing off stream storages. Potential solutions include Mt Lawless off-stream storage |
| 7 | Build new pipeline from existing storages | New | Extend the existing distribution network to allow the delivery of water to new areas for development. This initiative would also support greater security in the network for urban and industrial use. Potential solutions include connecting a pipeline from Paradise Dam to Coalstoun Lakes, Boondooma Dam, Kingaroy or Biggenden. |
| 8 | Build new headworks / off-stream storages and a new pipeline | New | Build new off-stream storages and supporting pipeline. This would extend the existing distribution network to allow the delivery of water to new areas for development. This initiative would also support greater security in the network for urban and industrial use. Potential solutions include connecting Boondooma Dam to Paradise Dam and/or a pipeline from Paradise Dam to Biggenden; Mt Lawless offstream storage (Burnett River). |
| 9 | Increase the size of existing storages and build a connecting pipeline | Improve existing | Increase the size and capacity of existing storages and build a connecting pipeline. This would extend the existing distribution network to allow the delivery of water to new areas for development. This initiative would also support greater security in the network for urban and industrial use. Potential solutions include raising Claude Wharton and Jones Weir, Boondooma Dam to Paradise Dam, a pipeline from Paradise Dam to Biggenden and/or a Mt Lawless off-stream storage (Burnett River) |
| 10 | Identify impediments to supply chain expansion opportunities resulting from increased scale of agricultural production | Reform | By identifying and removing impediments greater investment in associated local supply chain industries can occur. This additional growth may allow for even further development and expansion into new markets and areas. |

| No | Initiative | State Infrastructure Plan Category | Description |
|---|---|---|---|
| 11 | Tarong Power Station to source more of its water from Seqwater | Reform/better use | If Tarong Power Station was to utilise the water from Wivenhoe Dam more (or use recycled water from Luggage Point pumped via Wivenhoe Dam pipeline to Tarong), there would be less requirement on the existing allocation held in Boondooma Dam, thus freeing up this water for other users in the region. |
| 12 | Convert Gordonbrook Dam to irrigation use | Better use | Gordonbrook Dam is a South Burnett Regional Council-owned asset used primarily for urban water supply. It also provides a contingent supply when other storages/pipelines go offline. When not needed for urban supply, it could be provided to irrigators for use. |
| 13 | Improve transparency of the water trading market for both temporary transfer & nominal allocation water products | Reform | Improve the functioning of the water trading markets by improving the quality of the reporting and public information. |

## Conclusion and recommendation

This strategic business case has identified some problems and opportunities that could be addressed in the North and South Burnett Regional Council Areas. The benefits of addressing these issues could be significant.

Based on the identified initiatives (above), a long list of options for further consideration has been identified and aligned with the Statements of Service Needs developed in the ILM. Some of these options have significant constraints and risks, which are identified and explained for each option in Chapter 8. However, for completeness, options have not been excluded until the risks and uncertainties can be further explored. These options will be further refined and assessed in the preliminary business case.

It is recommended that a preliminary business case should be undertaken to further refine and assess the identified long list of options summarised below. The alignment between the option and the service need, is indicated by a shaded box.

Table 4: Options long list

| Option name | Alignment with Statement of Service Needs | | |
|---|---|---|---|
| | Security of urban water supply is poor and deteriorating, harming community welfare and limiting industrial expansion | Existing agricultural supplemented water allocations are highly unreliable resulting in reduced agricultural output, jobs and investment | Large areas of fertile land have no access to a reliable source of water hindering crop yields, values, diversity and the expansion of exports due to dependence on unreliable seasonal rains |
| Remove the 70,000 ML cut-off rule in Boondooma dam | | | |
| Inter-changeable water allocations between schemes | | | |
| Optimise in-scheme unsupplemented access rules | | | |
| Greater utilisation of the Wivenhoe to Tarong pipeline | | | |
| Raise Boondooma Dam | | | |
| Raise Claude Wharton Weir | | | |
| Raise Claude Wharton Weir and build a pipeline to area of urban or irrigation demand | | | |
| Raise Jones Weir | | | |
| Raise Jones Weir and build a pipeline to area of urban or irrigation demand | | | |
| Construct a re-regulating weir on the Boyne River | | | |
| Construct a re-regulating weir on the Barambah Creek | | | |
| Water harvesting | | | |
| Barambah Creek Dam at 39.3 km and irrigation network primarily for Coalstoun Lakes | | | |
| Barambah Creek Dam at 41.6 km and irrigation network primarily for Coalstoun Lakes | | | |

| Option name | Alignment with Statement of Service Needs | | |
|---|---|---|---|
| | Security of urban water supply is poor and deteriorating, harming community welfare and limiting industrial expansion | Existing agricultural supplemented water allocations are highly unreliable resulting in reduced agricultural output, jobs and investment | Large areas of fertile land have no access to a reliable source of water hindering crop yields, values, diversity and the expansion of exports due to dependence on unreliable seasonal rains |
| Barambah Creek Dam at 43.0 km and irrigation network primarily for Coalstoun Lakes | | | |
| Build a pipeline from Paradise Dam to Tarong – Wivenhoe pipeline via Coalstoun Lakes | | | |
| Build a pipeline from Paradise Dam to Boondooma Dam via Coalstoun Lakes | | | |
| Up to 100,000 ML dam or weir on Barambah Creek and irrigation network primarily for Coalstoun Lakes | | | |
| Agricultural supply chain improvements (e.g. local value add / increase processing of peanuts and blueberries) | | | |
| Tarong Power Station to source more of its water from Wivenhoe Dam | | | |
| Tarong Power Station to source more of its water from manufactured water products | | | |
| Flood harvesting from Barambah Creek into Bjelke-Petersen Dam | | | |
| Convert Gordonbrook Dam to irrigation use | | | |

The next stage (preliminary business case) will include:

a) consultation, research and analysis

b) filtering analysis and eliminating options – including an assessment of the economics, finance, stakeholder support and environment considerations (including climate change)

c) consideration of strategic alignment

d) assessment of likely investment costs to realise benefits and potential funding gaps

e) consideration of integration between projects

f) assessment of immediate and longer-term requirements.

# 1. Introduction

In November 2018, the Australian Government announced a grant to conduct a feasibility study to examine a range of options that increase water supply and security thereby underpinning an expansion of irrigated agriculture and delivering new jobs and economic growth in the North and South Burnett region of Queensland.

The grant is being administered by the Queensland Department of Natural Resources Mines and Energy (DNRME).

This strategic business case represents the first phase of the Australian Government funded feasibility study. The recommendations made in the strategic business case will form the basis of the options considered in the Preliminary Business Case. Jacobs has been engaged to complete both the strategic and preliminary business cases.

A detailed business case will then be commissioned to progress the reference projects identified in the preliminary business case, as projects with the greatest likelihood of meeting delivering the benefits sought.

Table 1.1: Progression of Business Case Development

| | Strategic Business Case | Preliminary Business Case | Detailed Business Case |
|---|---|---|---|
| Purpose | Conceptualisation:<br>▪ Articulate the service need to be addressed<br>▪ Identifies potential benefits | Options consideration:<br>▪ Re-confirms service need<br>▪ Generates possible options<br>▪ Analyses options<br>▪ Identifies preferred option/s<br>▪ Confirms whether to invest in Detailed Business Case | Preferred option/s analysis:<br>▪ Develops evidence for investment decision making |
| Project Assessment Framework stage | ▪ Strategic Assessment of Service Requirements (SASR) | ▪ SASR (Shortlist options)<br>▪ Preliminary evaluation | ▪ Business case |
| Supporting documents | ▪ Benefits Management Framework<br>▪ Investment Logic Mapping | ▪ Benefits Management Framework<br>▪ Social Impact Evaluation Guide<br>▪ Cost Benefit Analysis Guide | ▪ Benefits Management Framework<br>▪ Social Impact Evaluation Guide<br>▪ Cost Benefit Analysis Guide |

*Source: Building Queensland*

This strategic business case has been developed using endorsed Queensland and Australian Government best-practice infrastructure and project evaluation frameworks.

# 2. Service need and problem identification

The service need may result from a problem or opportunity, and this section presents the related evidence base.

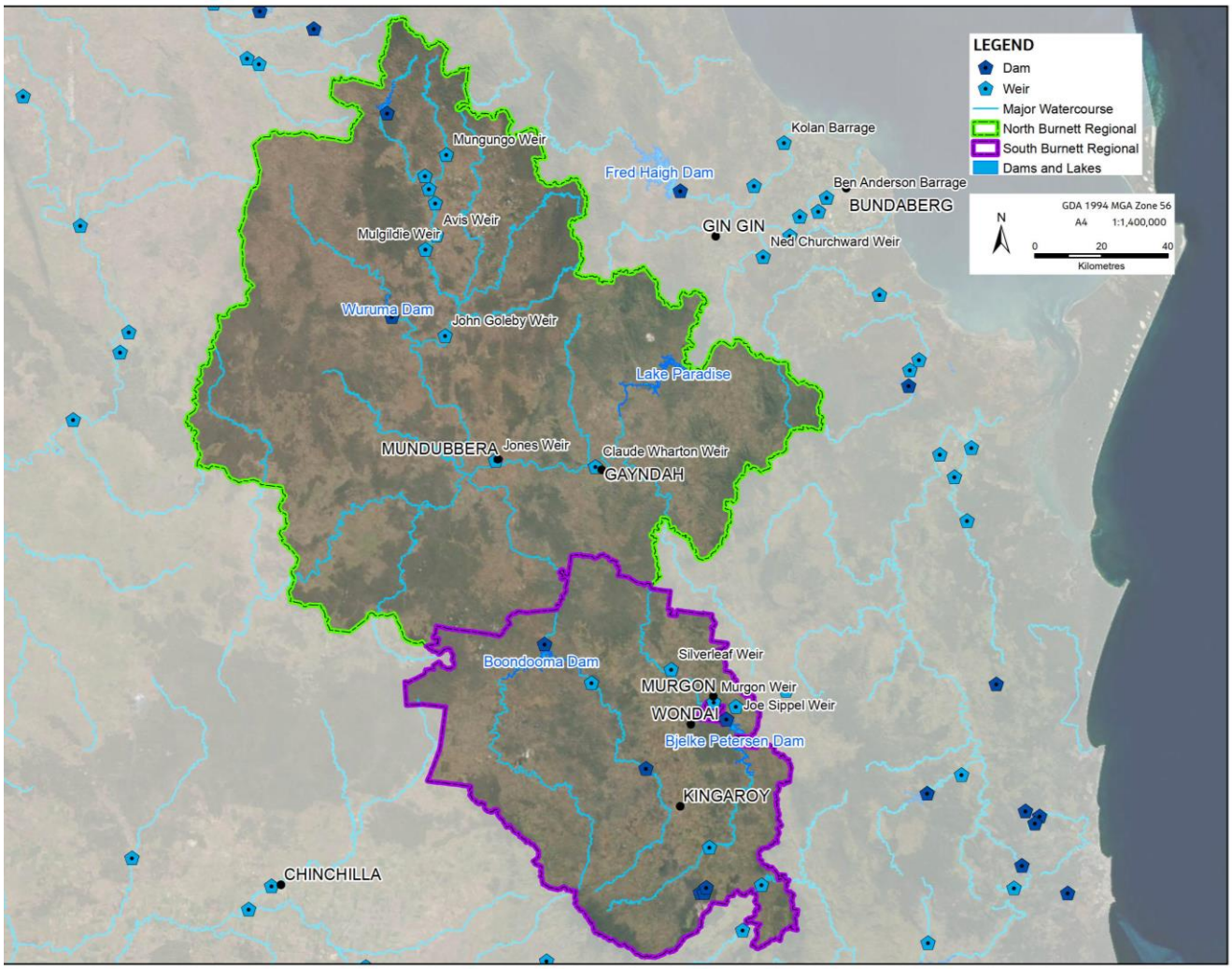
A five-step process was followed to complete the service need assessment. The steps involved:

1) Documenting the background information of the North and South Burnett including demographic, economic, social, climatic and hydrological information (study area issues and opportunities)
2) Reviewing and documenting all historical materials including relevant previous studies
3) Undertaking a gap analysis to identify where further early investigation and evidence is required, to most efficiently advance the understanding of the service need
4) Further investigations and collection of evidence through stakeholder engagement
5) Holding two Investment Logic Mapping (ILM) workshops to refine and confirm the problems and opportunities that define the service need.

## 2.1 Study area issues and opportunities

The study area is identified in Figure 2.1 below.

Figure 2.1: Map of the study area



### 2.1.1 Employment sectors

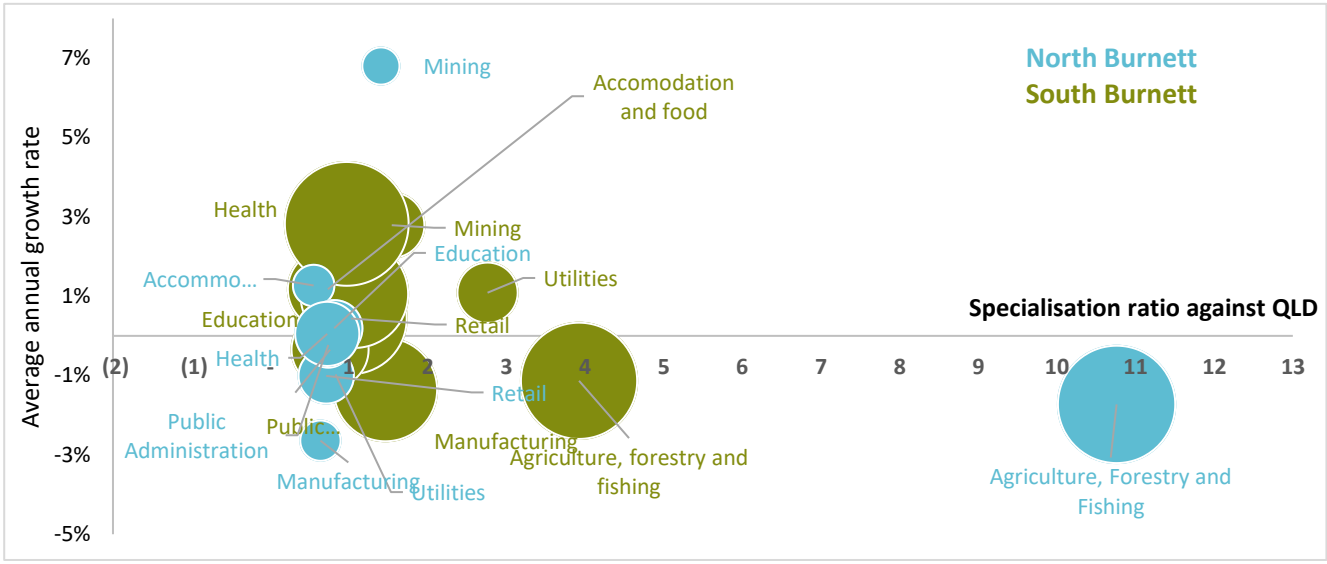
The agricultural sector is the dominant employer in the Burnett region. This section shows the relative employment opportunities in each region. The below three figures show the specialisation ratio of employment in each region. Each major industry is plotted on the graph:

- The average annual growth rate over the past ten years is shown on the vertical x-axis. The higher the bubble, the higher than average annual growth rate
- The specialisation ratio is shown on the horizontal y-axis. The further to the right, the greater the specialisation relative to Queensland as a whole. For example, in the figure below, employed people in the North Burnett are 11 times more likely to be employed in Agriculture, Forestry and Fishing than Queensland as a whole
- The size of the bubble indicates the relative current size of employment. The bigger the bubble, the more people are employed.

The figure below shows both the North and South Burnett together. The following two figures show each individually for additional clarity.

When shown together, it is clear that agriculture employs a similar amount of people in each region, due to the size of the bubble, but that the (blue) North Burnett bubble is much further to the right. This indicates that more people are employed in agriculture, relative to the rest of Queensland in the North Burnett than the South Burnett. The South Burnett has several large employment industries, whereas the North has a single large employment industry.

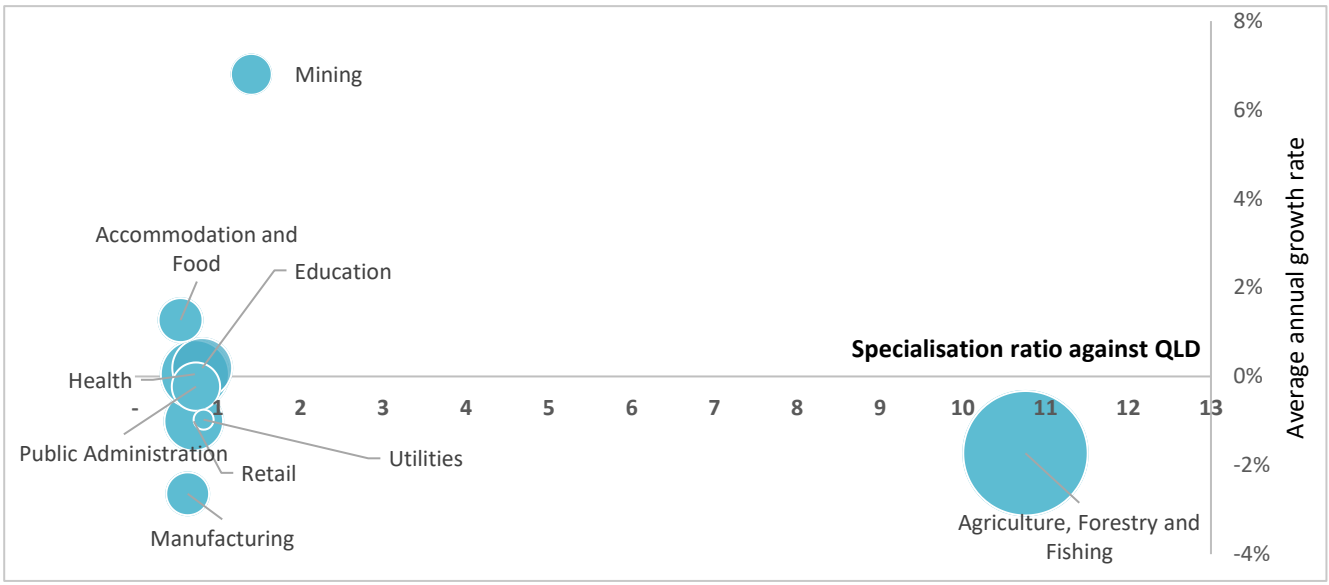
Figure 2.2: Specialisation ratio in the North and South Burnett (%)




*Source: ABS Census of Population and Housing (2016)*

In the North Burnett, agriculture is a dominant employer with employed people 11 times more likely to be employed in Agriculture, Forestry and Fishing than Queensland as a whole. However, between 2006 and 2016, the number of employed people has been decreasing by 1.7 per cent per year. Most other industries are clustered with a specialisation ratio just below 1.0 with relatively stable employment growth. However, mining employment has increased from 87 to 149, an average annual increase of 6.8 per cent.

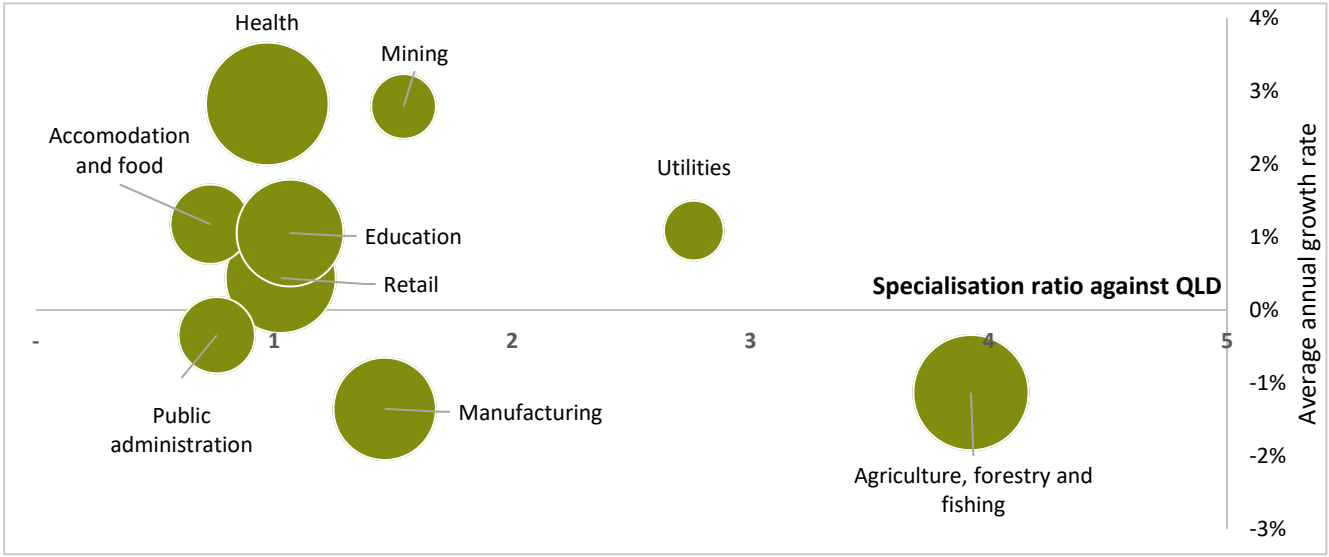
Figure 2.3 : Specialisation ratio in the North Burnett (%)




*Source: ABS Census of Population and Housing (2016)*

In addition to agriculture, the South Burnett has several large employment industries, including utilities, retail, manufacturing (which includes abattoir workers) and health.

Figure 2.4 : Specialisation ratio in the South Burnett (%)



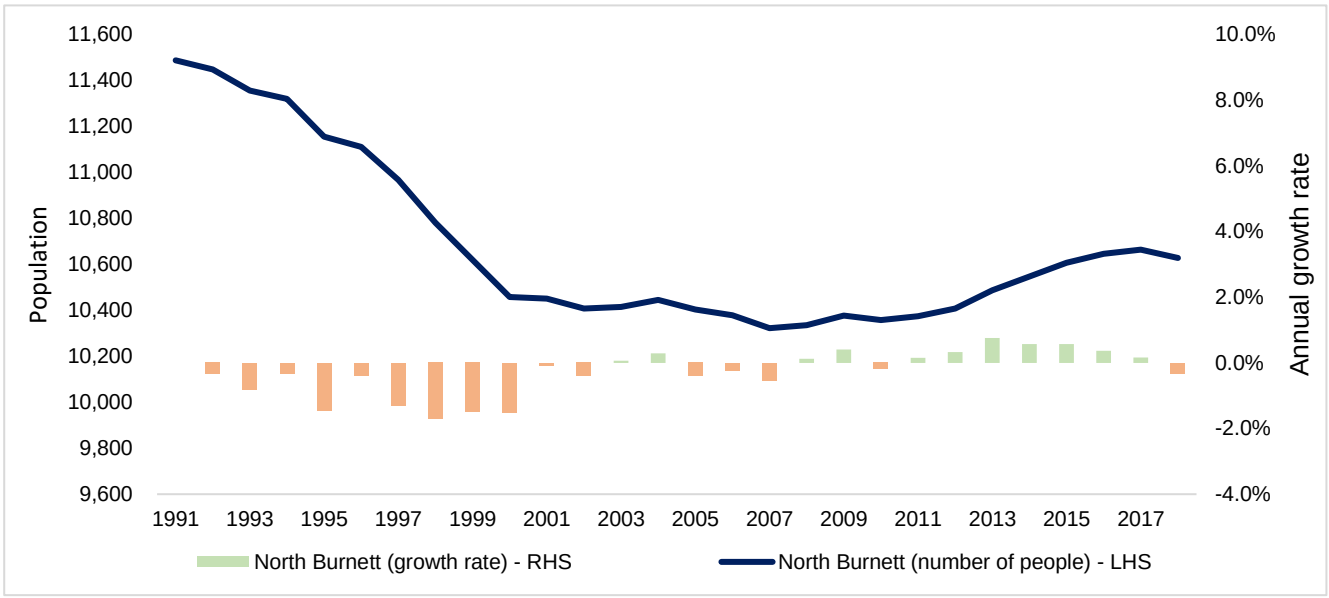

*Source: ABS Census of Population and Housing (2016)*

### 2.1.2 Population

The population in the Burnett region are highly influenced by the available economic opportunities. The population across the Burnett region has increased by 17 per cent since 1991, however, the experience of the two council areas has differed

As shown in Figure 2.5 , the population of the North Burnett decreased by ten per cent in the 20 years to 2011. However, since that time, the population has increased by 254 people (2.4 per cent). This turnaround is believed to be caused by the increase in blueberry production that has employed an additional 400 – 500 people.

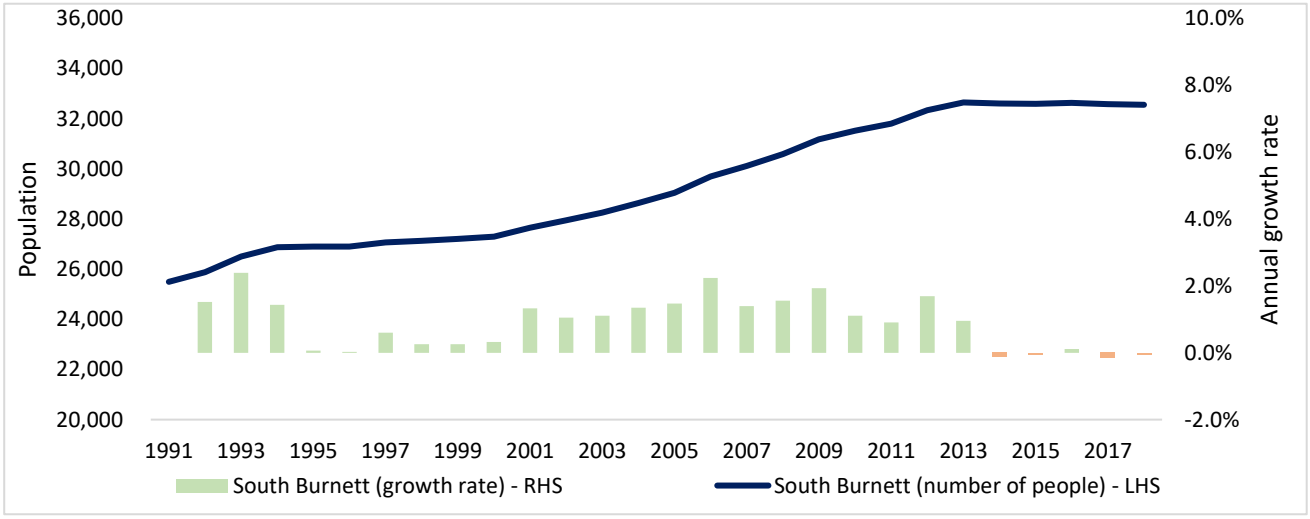
Figure 2.5: Population in the North Burnett




*Source: QGSO, Queensland – North Burnett*

The population of the South Burnett grew strongly in the early 1990s, due partly to the second stage of the expansion of Tarong Power Station. Population has been flat since 2013, which could have been caused by the 2012 shutdown of two generating units, which have since been restarted.

Figure 2.6: Population in the South Burnett

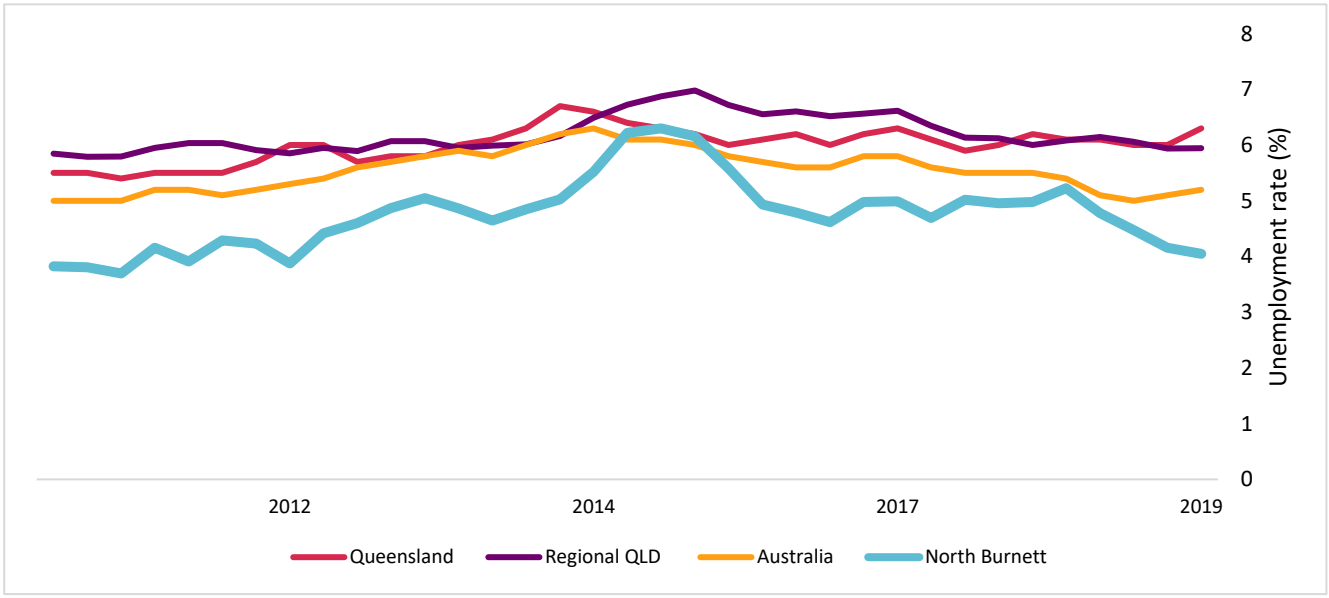



*Source: QGSO, Queensland – South Burnett*

### 2.1.3 Employment

The Wide-Bay Burnett region has historically had high levels of unemployment. The unemployment rate for this area was the fifth highest of all 19 SA4s[3] within Queensland in December 2019[4]. In the North Burnett, the unemployment rate has historically been low, relative to other areas. This low rate is driven by itinerant workers who come to the area for work and leave when work is not available. Also, unemployed residents tend to leave the area to find work elsewhere, or be unemployed elsewhere, causing the declining population.

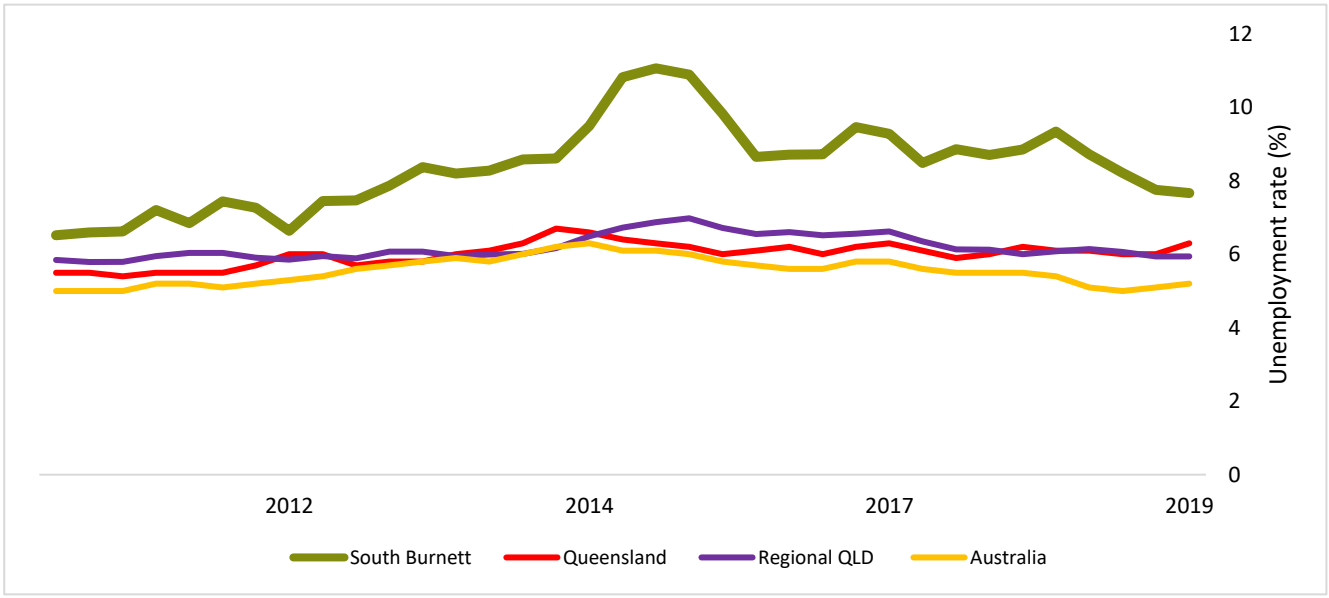
Figure 2.7: Unemployment rate in the North Burnett (%)




*Source: QGSO, Queensland – North Burnett*

The South Burnett has a high unemployment rate caused by a shrinking employment base of key sectors.

Figure 2.8: Unemployment rate in the South Burnett (%)




*Source: QGSO, Queensland – North Burnett*

[3] Statistical Level 4
[4] https://www.qgso.qld.gov.au/issues/3426/regional-labour-force-201912-wide-bay-sa4.pdf

### 2.1.4 Socio-economic disadvantage

The Socio-Economic Indexes for Australia considers Income, Education, Employment, Occupation, Housing and other key indicators and provides a score. The lower the score the greater the indicator of disadvantage in an area than the national average.

The disadvantage level in the North and South Burnett is high compared with the rest of Queensland and Australia.

Several towns such as Nanango and Kingaroy North are ranked in the top quartile of QLD's 513 Statistical Local Areas (SLAs) for socio-economic disadvantage (Table 2.1) (ABS, 2016). Cherbourg (13km from Wondai) according to this index is the most disadvantaged suburb in QLD according to this index.

Table 2.1: Ranking of relative socio-economic disadvantage within QLD

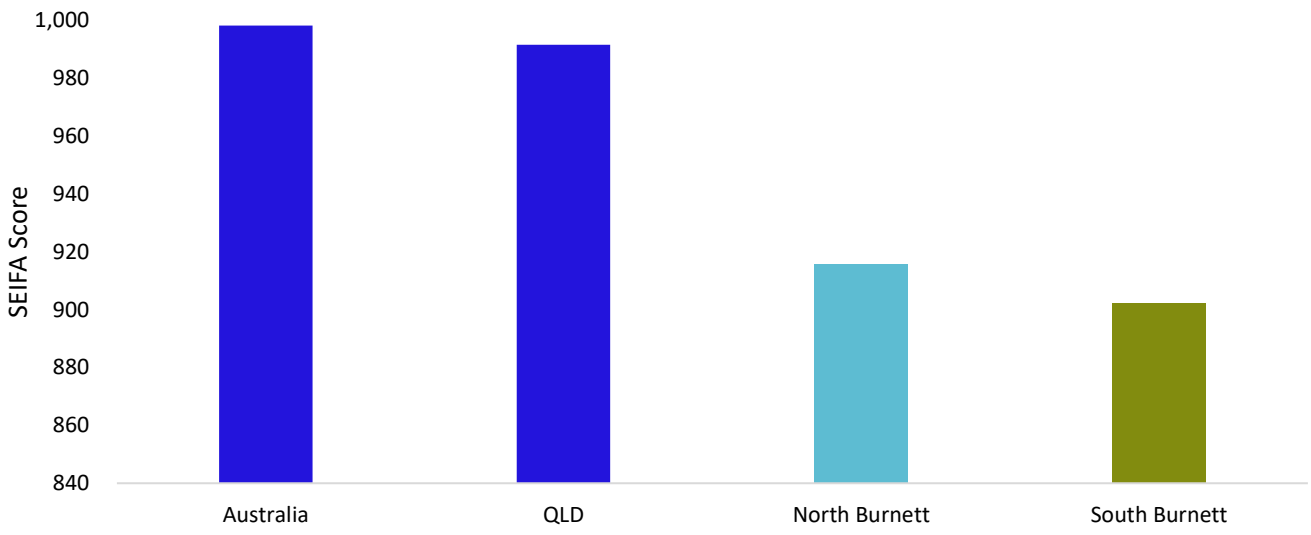
| Region | Ranking within QLD (513 SLAs) |
|---|---|
| Kingaroy Region - North | 20 |
| Nanango | 28 |
| Gayndah - Mundubbera | 62 |
| Monto - Eidsvold | 66 |
| Kingaroy | 94 |
| Kingaroy Region - South | 204 |

Figure 2.9 provides a comparison on the social economic disadvantage level (SEIFA) across the North and South Burnett, Queensland and Australia. A low SEIFA score indicates relatively greater disadvantage in general. For example, an area could have a low score if there are:

- many households with low income
- many people with no qualifications
- many people in low skill occupations.

The North and South Burnett have SEIFA scores which are substantially than the Queensland and Australia score.

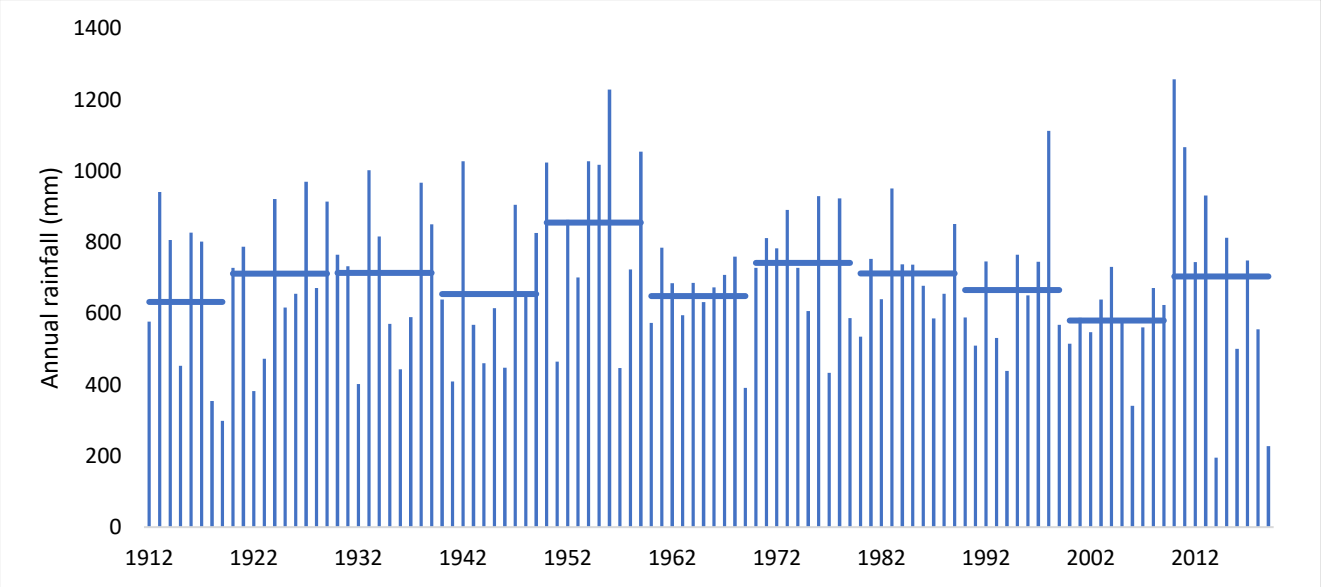
Figure 2.9 : Socio-economic disadvantage in the North and South Burnett



### 2.1.5 Climatic conditions

The North Burnett experiences approximately 635 mm of rainfall per year. In 90 per cent of years rainfall exceeds 441 mm and exceeds 968 mm in 10 per cent of years. However, the maximum rainfall (1,257mm in 2010) and minimum rainfall (195 mm in 2014) have occurred in the most recent decade.

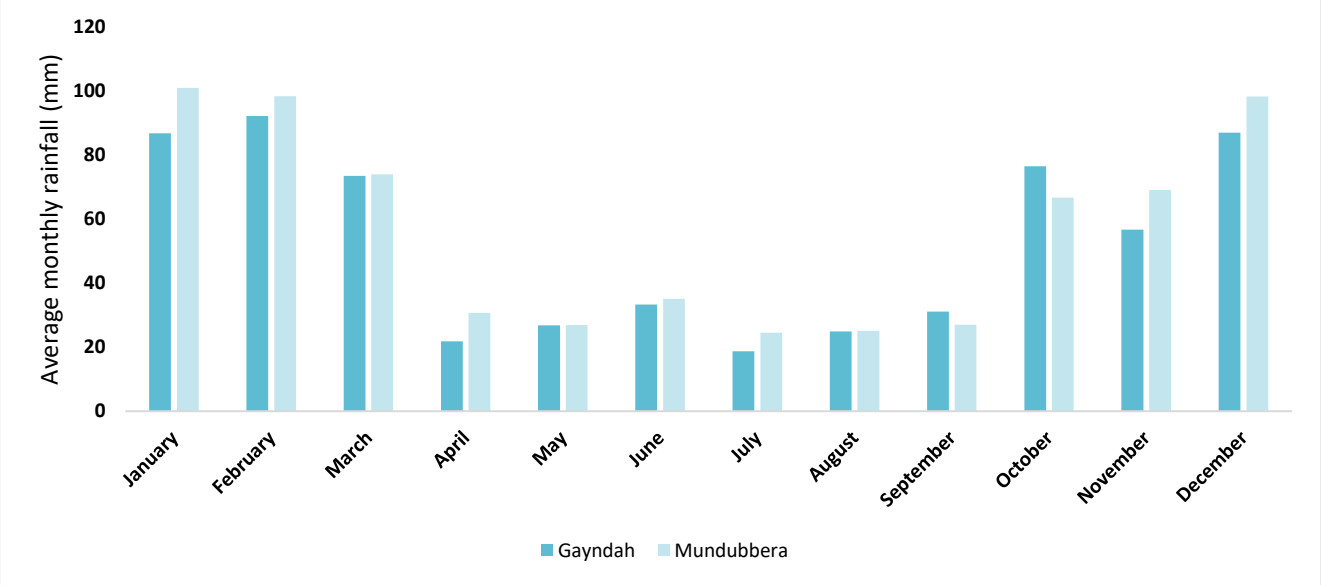
Figure 2.10: Annual rainfall (mm)




*Source: BOM, Station number 39073*

There is a distinct wet period (October to March) when 75 percent of rain falls and a dry period (April to September) (Figure 2.11).

Figure 2.11 : Average monthly rainfall (mm)

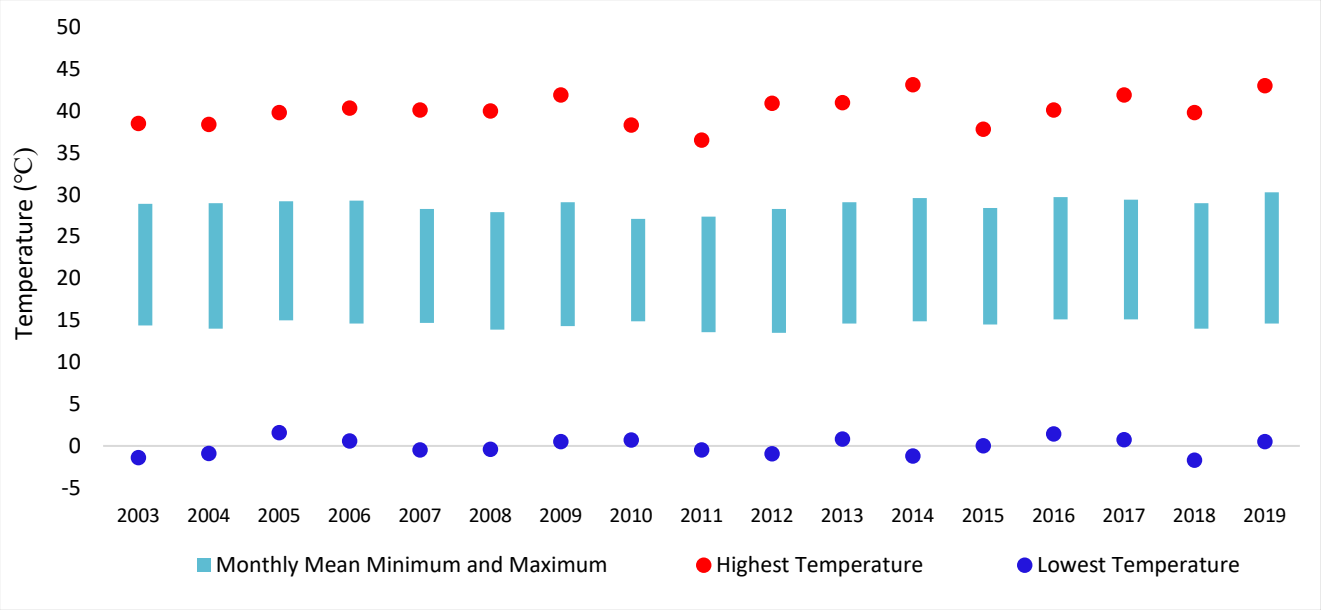



*Source: BOM. Station numbers 039066 (Gayndah airport) 39073 (Mundubbera)*

There are a number of microclimates across the North Burnett, each of which can be suitable for different crops at different times. Citrus, which is common in the area, will tolerate high temperatures provided the trees are well supplied with soil moisture. Trees are sensitive to frost, but this varies with variety, tree age and health. Wind generators can be used to mitigate frosting on sensitive tree crops.

A young tree or a tree with a recent growth flush will be damaged by even very light frosts. A mature tree that has hardened off may tolerate temperatures down to -5°C for a short time without being seriously affected. Leaf, branch and fruit damage can occur. Figure 2.12 shows that the minimum temperate can drop below freezing, in most years, although only marginally, and only for a short time.

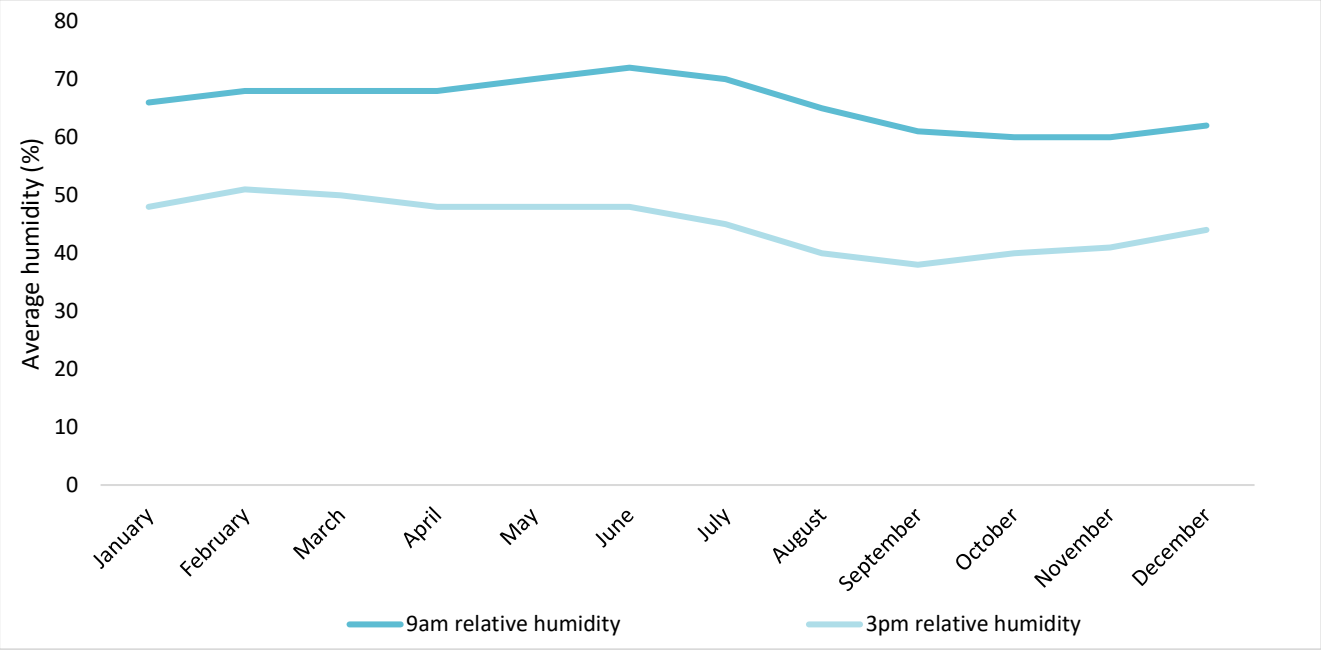
Figure 2.12 : North Burnett historical temperature (degrees celsius)




*Source: Bom, Station number 039066 (Gayndah airport)*

Relative humidity greatly affects evaporation rates. When it is high, relative humidity slows evaporation; relative humidity reduces it to zero (no evaporation at all) when it reaches 100 percent.

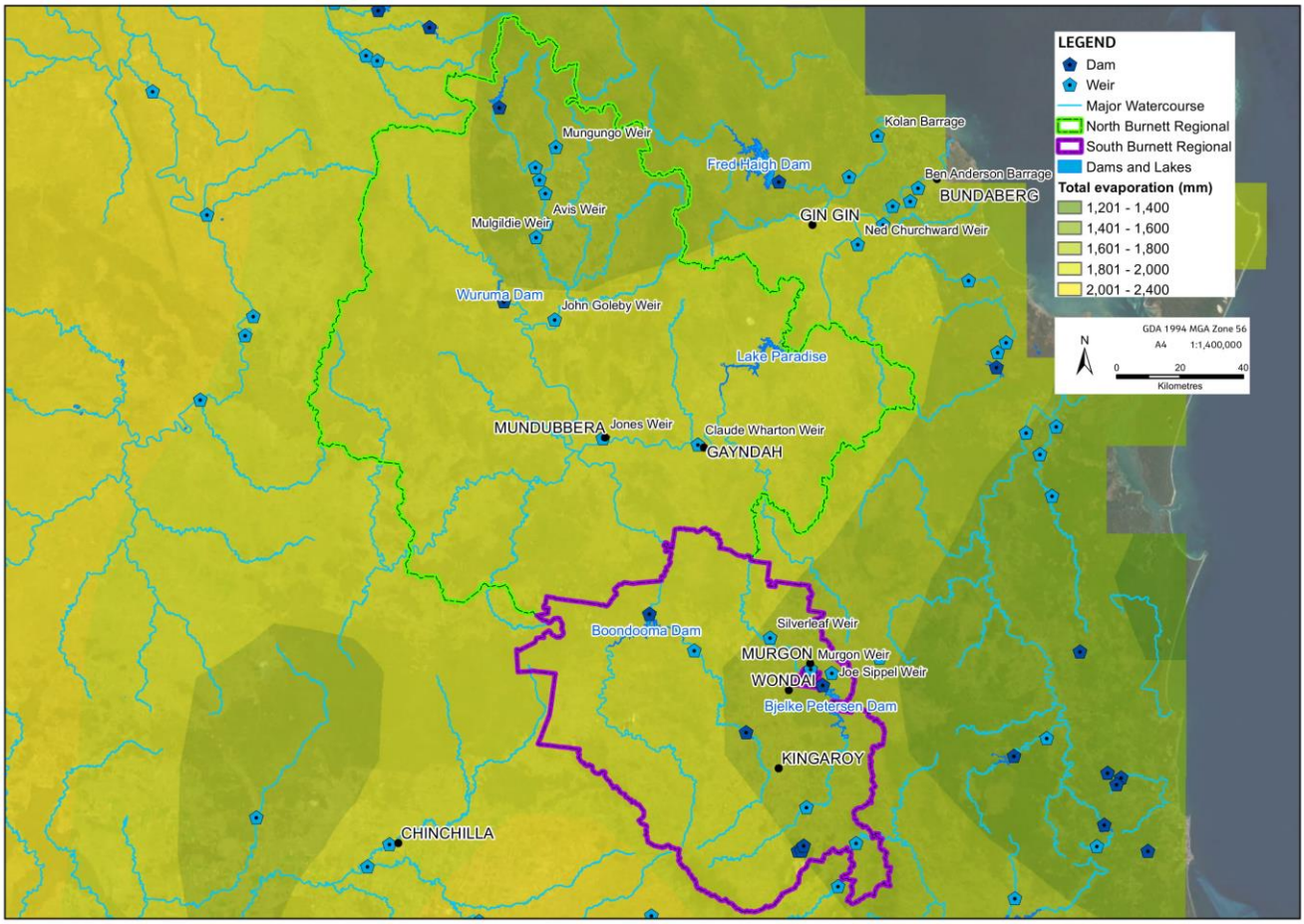
Figure 2.13 : North Burnett relative humidity




*Source: Bom, Station numbers 039066 (Gayndah airport)*

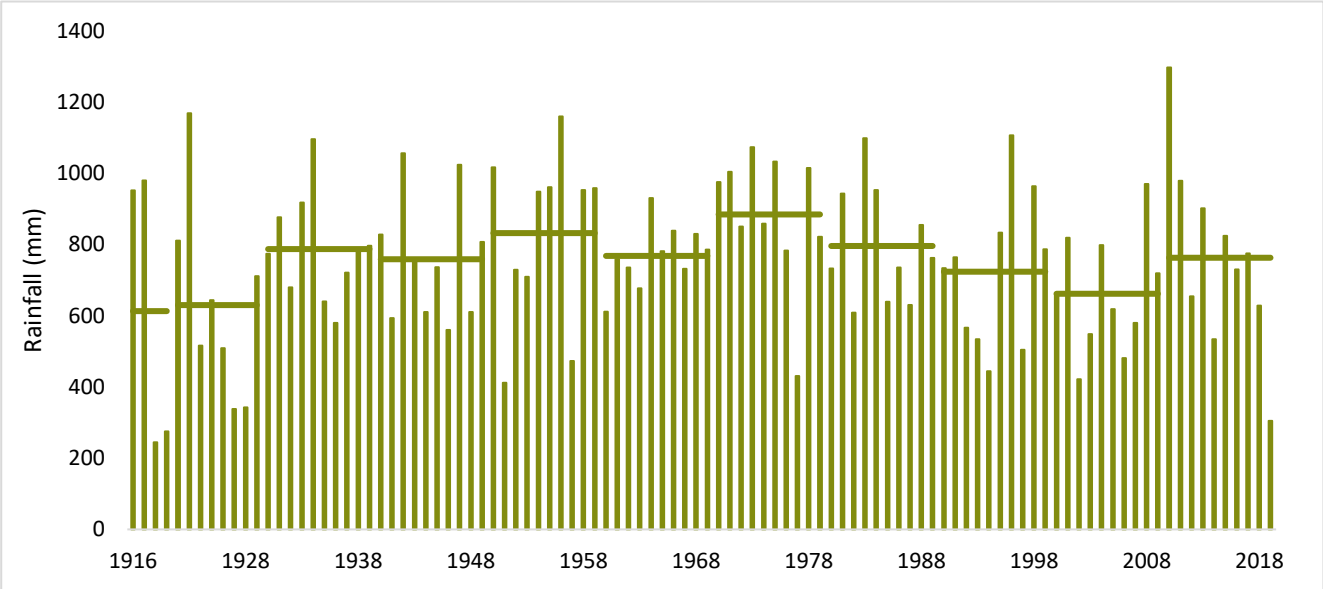
The Burnett region experiences moderate rates of evaporation, up to 1,800 mm over most of the region.

Figure 2.14 : Evaporation in the Burnett Region




The South Burnett experiences approximately 757 mm per year. In 90 per cent of years rainfall exceeds 483 mm and exceeds 1,016 mm in 10 per cent of years. The maximum rainfall of 1,297mm occurred in 2010 and minimum rainfall of 244 mm occurred in 1918).

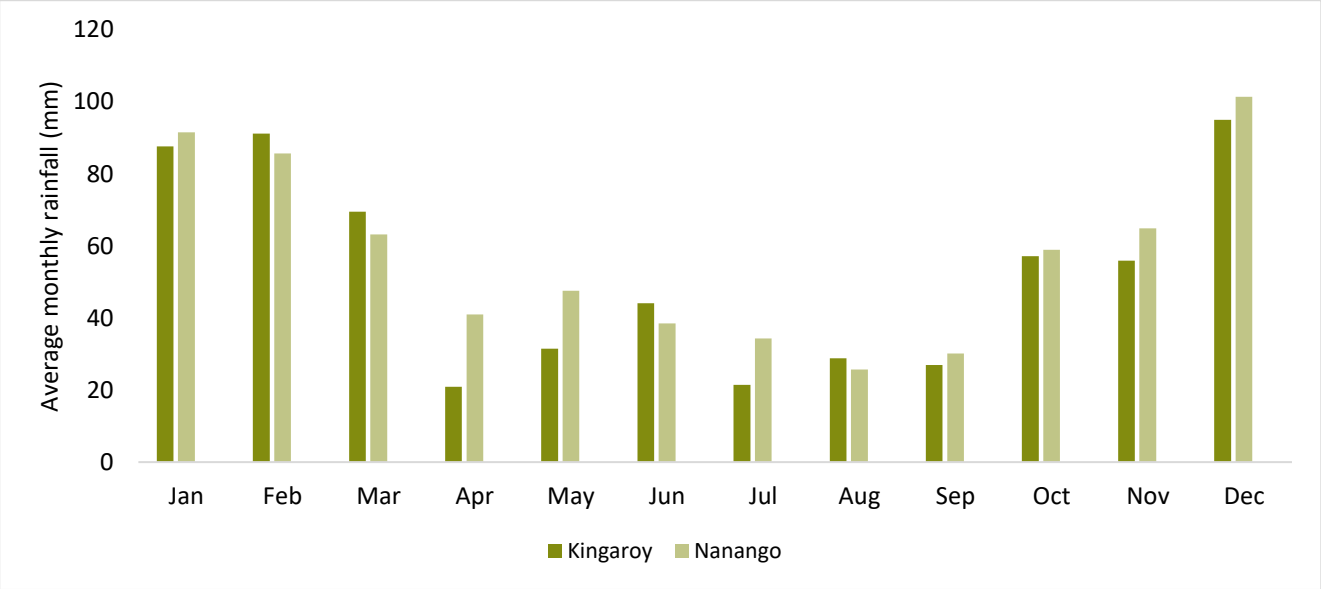
Figure 2-15 : Recorded Annual rainfall (mm)




*Source: Bom, Kumbia, station number 40113*

There is a distinct wet period (October to March) when 70 percent of rain falls and a dry period (April to September) (Figure 2.16).

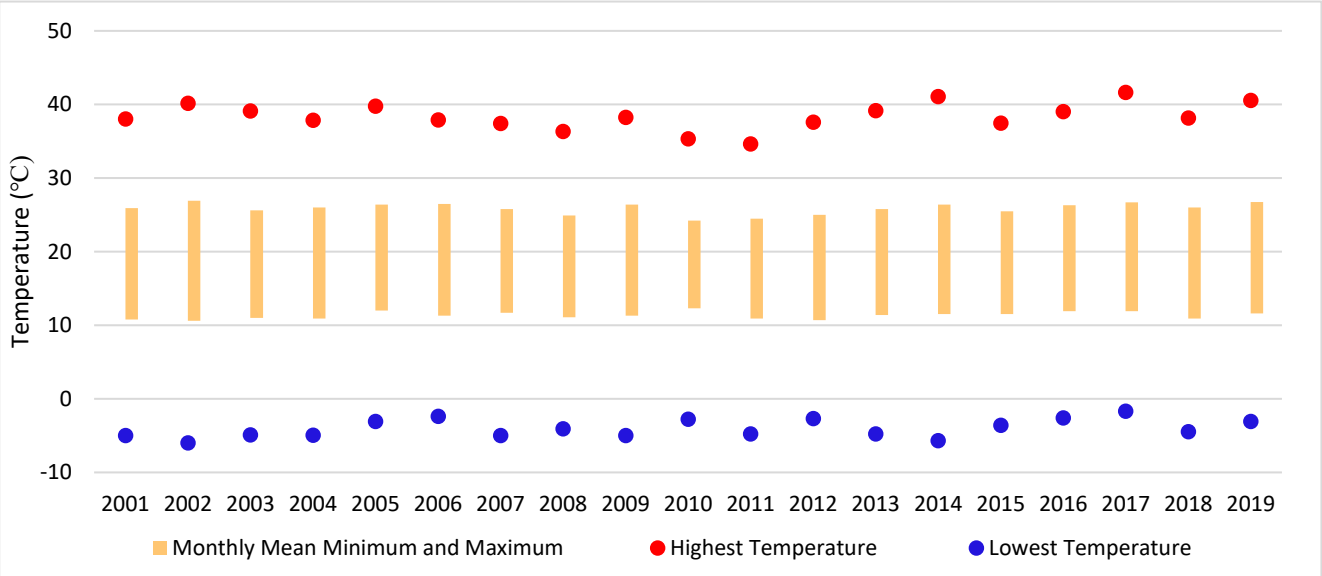
Figure 2.16 : Average monthly rainfall (mm)




*Source: BOM, Station numbers 040922 (Kingaroy airport) and 040158 (Nanango, Wills St)*

There are a number of microclimates across the South Burnett, each of which can be suitable for different crops at different times. However, the incidence of sub-zero degree days indicates that citrus is less likely to be suitable – however, locations other than Kingaroy may be more suitable.

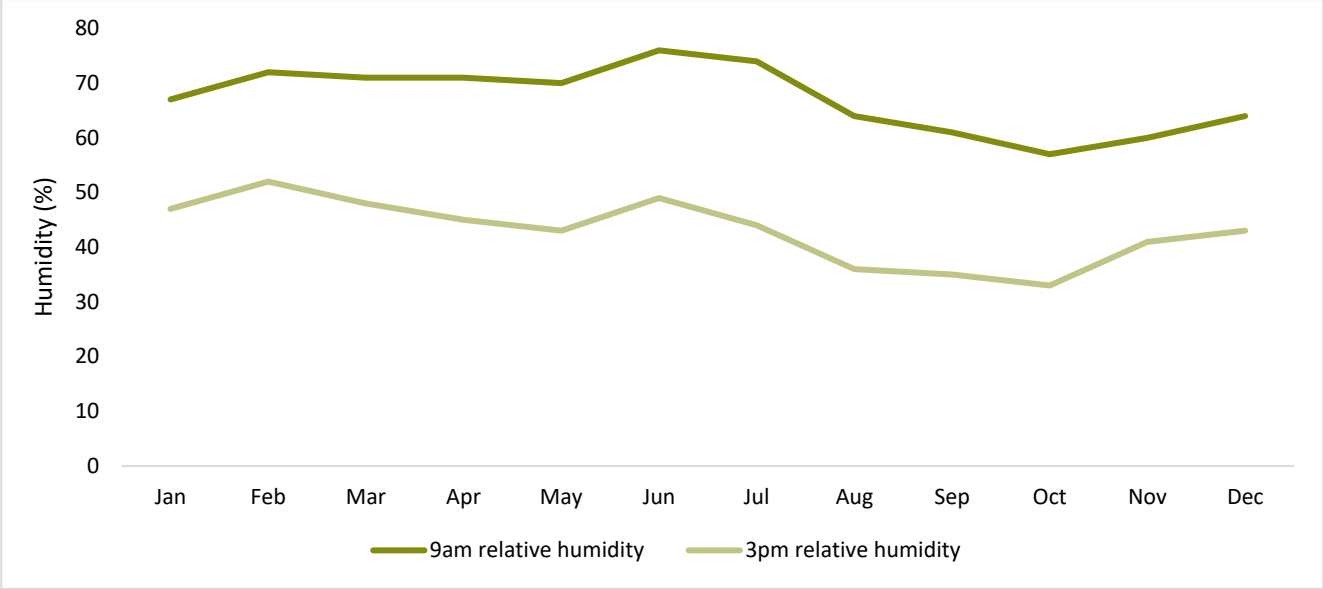
Figure 2.17 : South Burnett historical temperature (degrees celsius)




*Source: Bom, Station numbers 040922 (Kingaroy airport)*

Relative humidity greatly affects evaporation rates. When it is high, relative humidity slows evaporation.

Figure 2.18 : South Burnett relative humidity



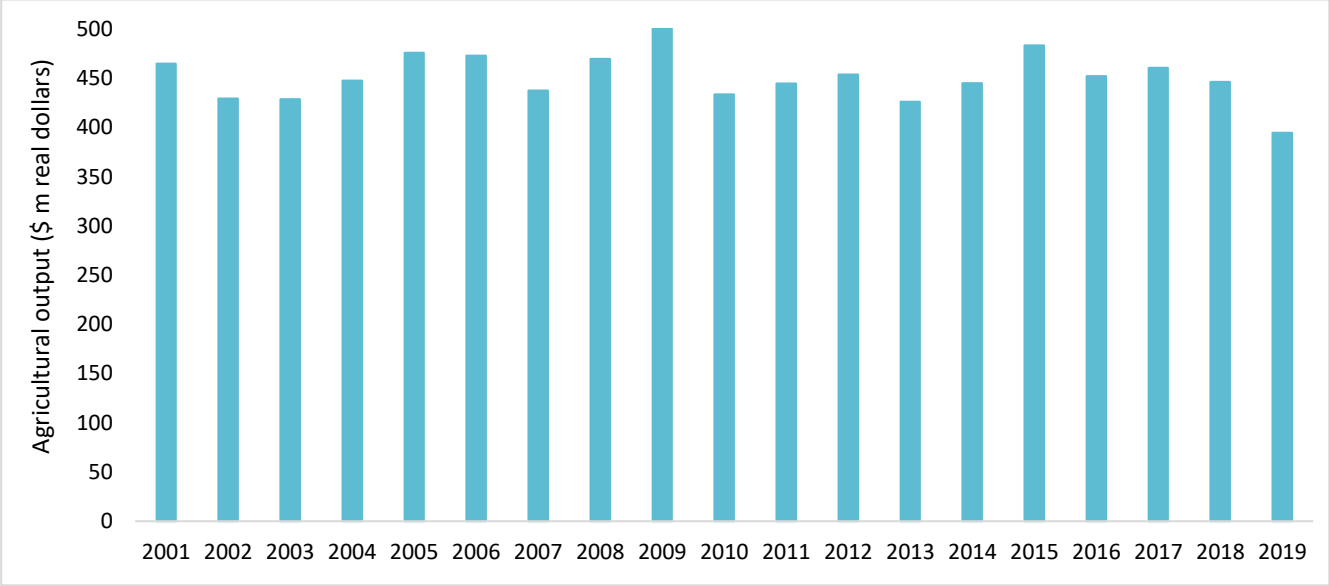

*Source: Bom, Station numbers 040922 (Kingaroy airport)*

### 2.1.6 Current agricultural production

In the North Burnett, agricultural production has remained relatively constant over the past ten years, with some variation over time. The decrease in production in 2013 was due to widespread flooding impacting Monto which has a large mung bean production area. Other areas also had reductions in citrus and fodder.

In 2015 North Burnett received significant rain which led to increased production levels. The 2017 to 2019 decline coincides with the onset of the current drought.

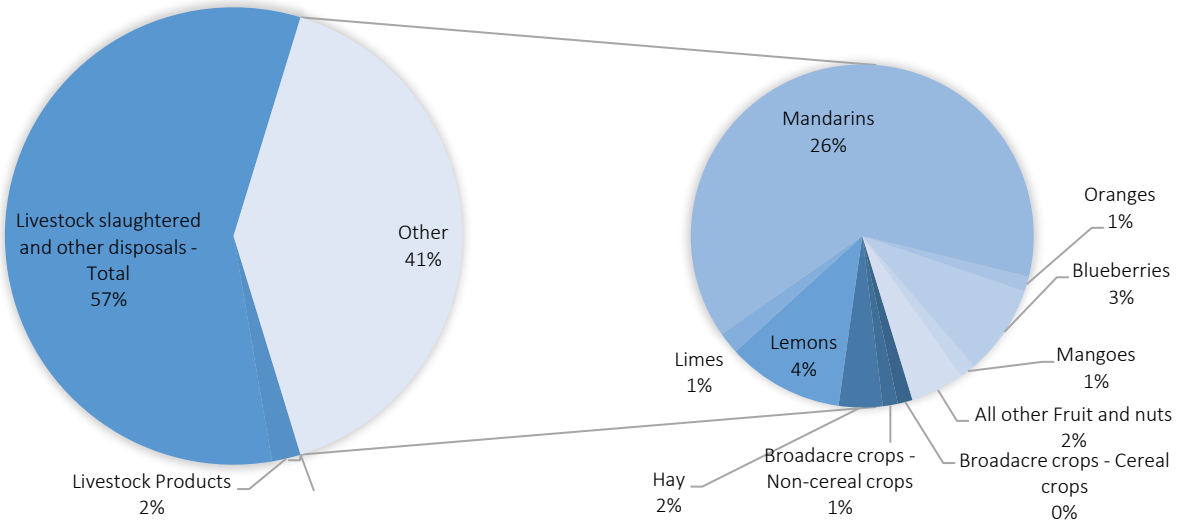
Figure 2.19 : North Burnett agricultural output ($ million)




*Source: economy.id Queensland – North Burnett*

The majority of agricultural value is produced from livestock. However, mandarins are the dominant irrigated crop. Since 2016, there has been significant expansion in blueberry production.

Figure 2.20: Percentage of gross value of agricultural commodities produced by crop – North Burnett LGA

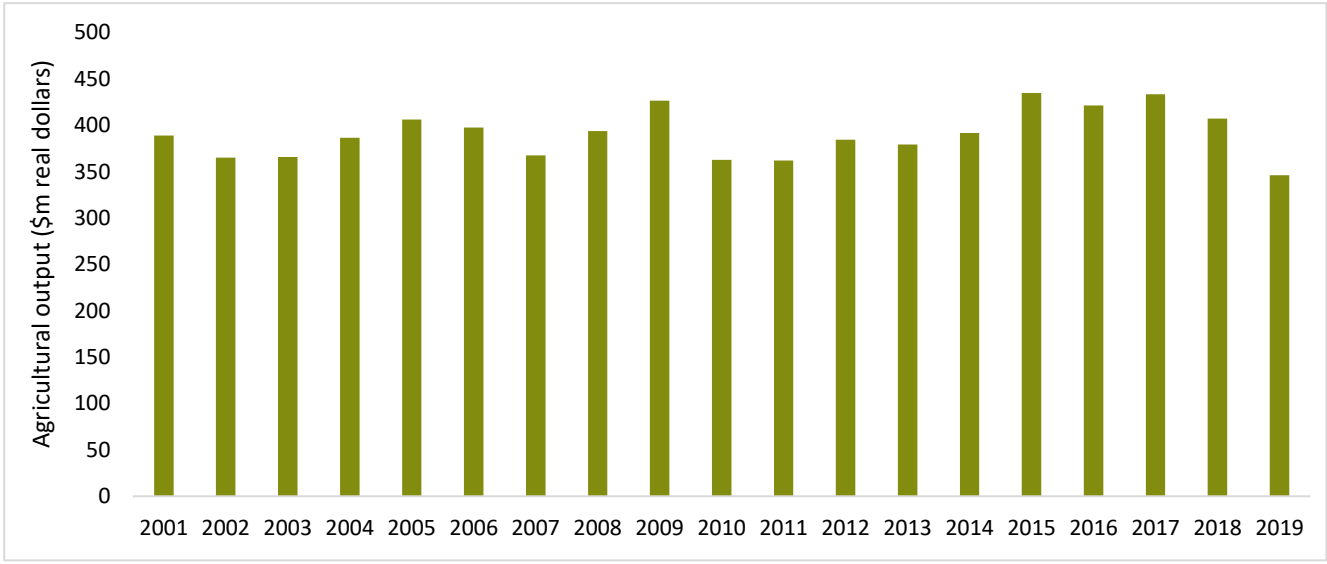



*Source: Agricultural census (2016)*

Within livestock, is intensive livestock production, which is high value and has a need for relatively small volumes of reliable water. In the South Burnett, cattle and calves contribute $186 million.

Agricultural production in the South Burnett has fluctuated over the past ten years. There was good rainfall in 2014 to 2016 which resulted in higher levels of production. However, the boxing day storms impacted on areas of high value (tree crop) production. This impacted on production. Likewise, the current drought has impacted production in recent years.

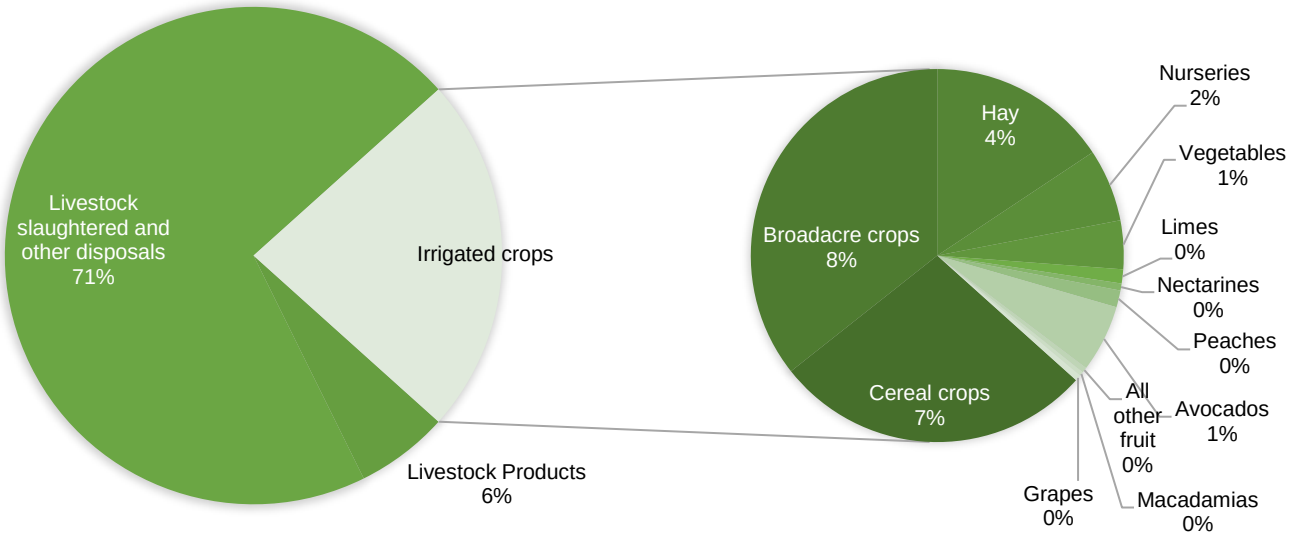
Figure 2.21 : South Burnett agricultural output ($ million)




*Source: economy.id Queensland – South Burnett*

Similar to the North, the majority of agricultural production relates to livestock. Approximately one quarter of cropping relates to relatively high value fruit, vegetables and nuts.

Figure 2.22: Percentage of gross value of agricultural commodities produced – South Burnett LGA




*Source: Agricultural census (2016)*

Within livestock, is intensive livestock production, which is high value and has a need for relatively small volumes of reliable water. In the South Burnett, cattle and calves contribute $77 million and pigs are $58 million.

### 2.1.7 Existing Infrastructure

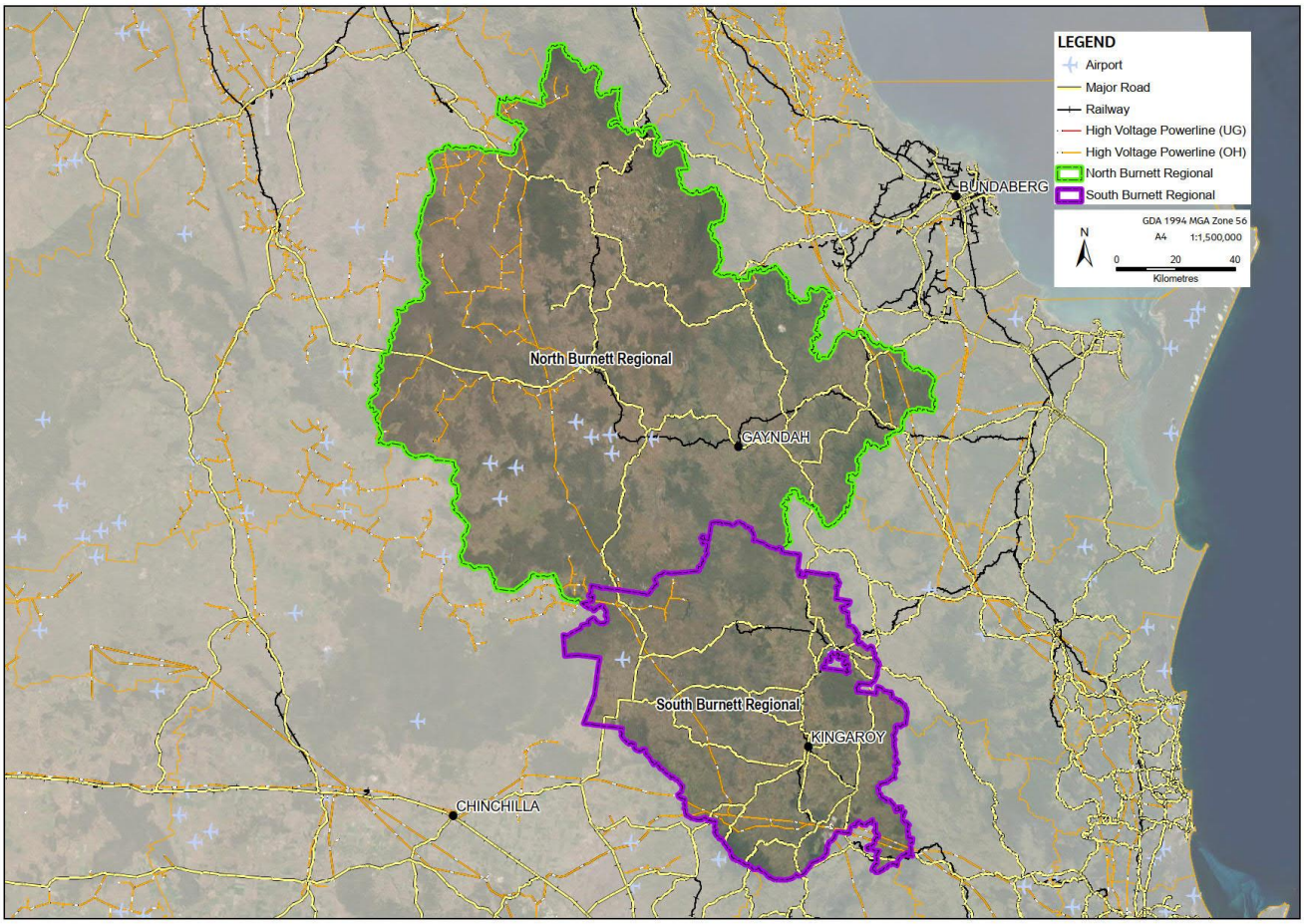
The Burnett region is located adjacent to South-East Queensland and has good access to major markets and logistical hubs. Travel time from within the Burnett to logistical hubs is generally between two and four hours.

Table 2.2 : Road travel time

| | Brisbane (Rocklea) | Bundaberg Port | Wellcamp |
|---|---|---|---|
| Gayndah | 332 km / 4 hours | 168 km / 2 hours | 295 km / 4 hours 20 mins |
| Mundubbera | 369 km / 4 hours 20 mins | 205 km / 2 hours 30 mins | 386 km / 3 hours |
| Nanango | 192 km / 2 hours 15 mins | 288 km / 3 hours 15 mins | 132 km / 1 hour 30 mins |
| Kingaroy | 217 km / 2 hours 30 mins | 266 km / 3 hours | 147 km / 2 hours |

There are major roads leading to the Brisbane markets at Rocklea, ports in Brisbane and Bundaberg, and major airports in Brisbane, Bundaberg and Wellcamp. Export opportunities from Wellcamp are increasing, with one refrigerated plane leaving for Asia each week.

Figure 2.23 : Existing infrastructure



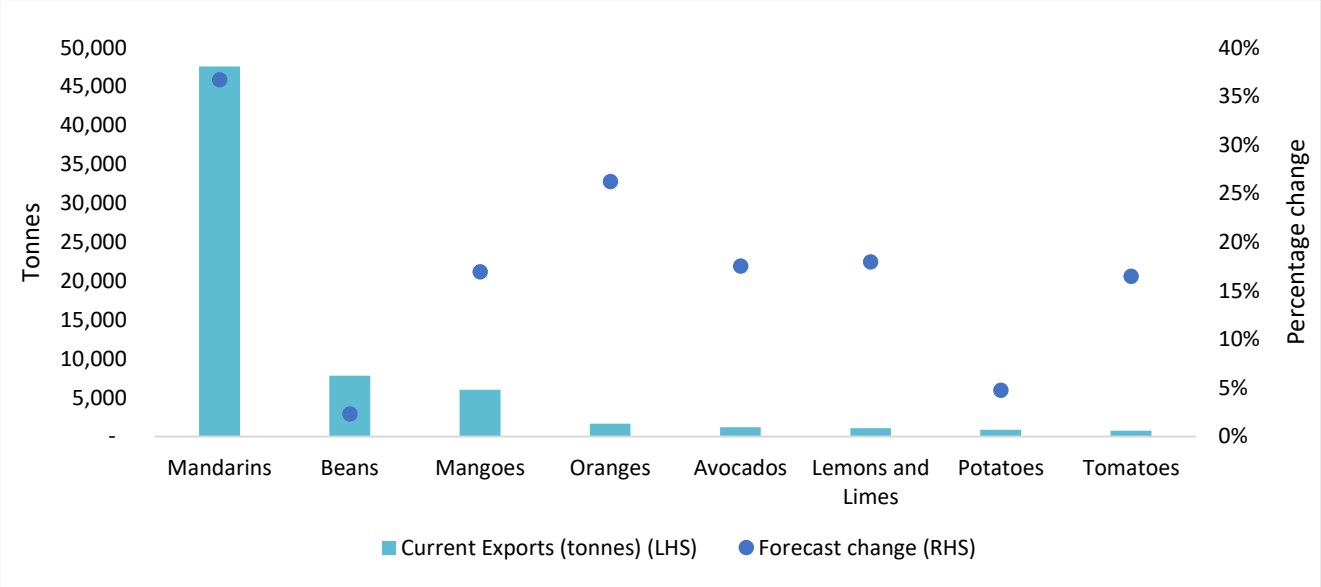

### 2.1.8 Export opportunities

The North and South Burnett grow crops which are suitable for export. This means that additional production will not simply displace other domestic production but can be exported to international markets. In the North Burnett, mandarins are a valuable crop. A number of recent free trade arrangements have come into effect, which have provided access into lucrative Asian markets. As a result, some farmers are exporting up to 90 per cent of their produce.

The figure below shows the crops grown in the North Burnett region and the amount of exports (blue bars). The blue dots show the forecast growth in exports. Mandarins are the dominant export and are expected to continue to grow strongly. In the North Burnett, the key constraint to meeting this growth is access to reliable water.

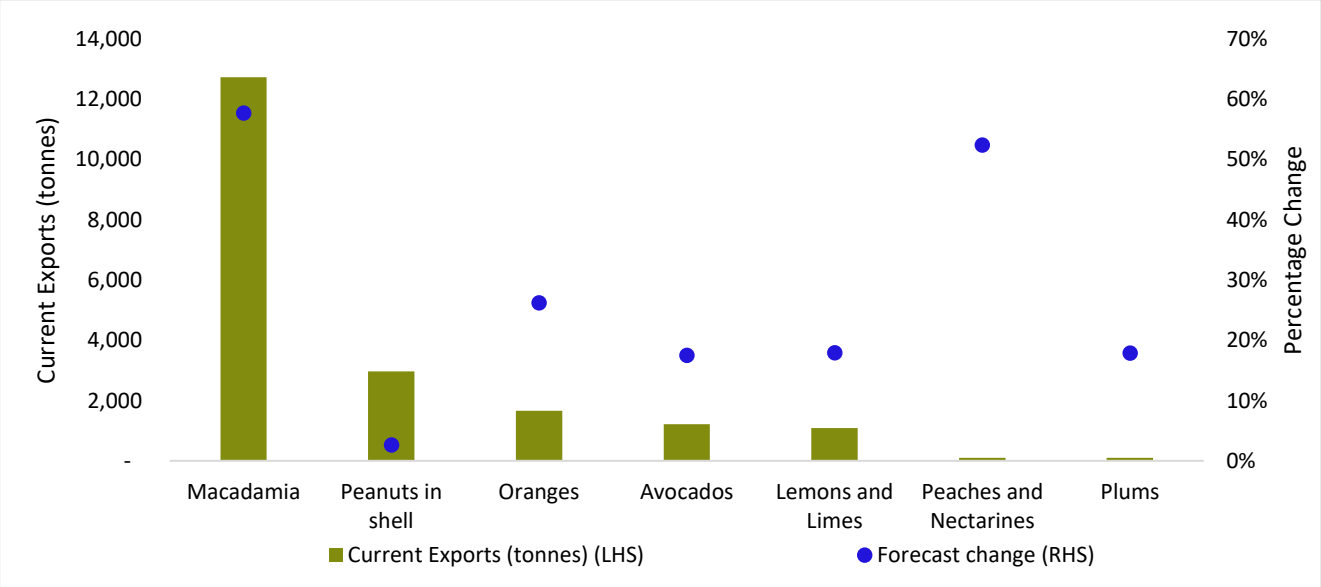
The figure below shows exports from across all of Queensland, focusing on crops common in the North Burnett.

Figure 2.24: Queensland actual exports and forecast exports – North Burnett crops




The South Burnett has fewer exports. However, while a small volume of peanuts is exported, Bega imports 80 per cent of the peanuts it needs to make peanut butter. An increase in the number of local peanuts could satisfy this demand, reduce imports, and not change the domestic price for peanuts.

Figure 2.25: Queensland actual exports and forecast exports - South Bunett crops




### 2.1.9 Electricity network capacity

Some industries require access to electricity distribution capacity. It can be expensive to increase capacity, so understanding the capacity in the network can reduce the costs of delivering water and / or processing the resulting product. There is available capacity in Monto, Mount Perry, Gayndah and Mundubbera (refer Figure 2.26).

Figure 2.26 : Electricity network capacity (MVA)

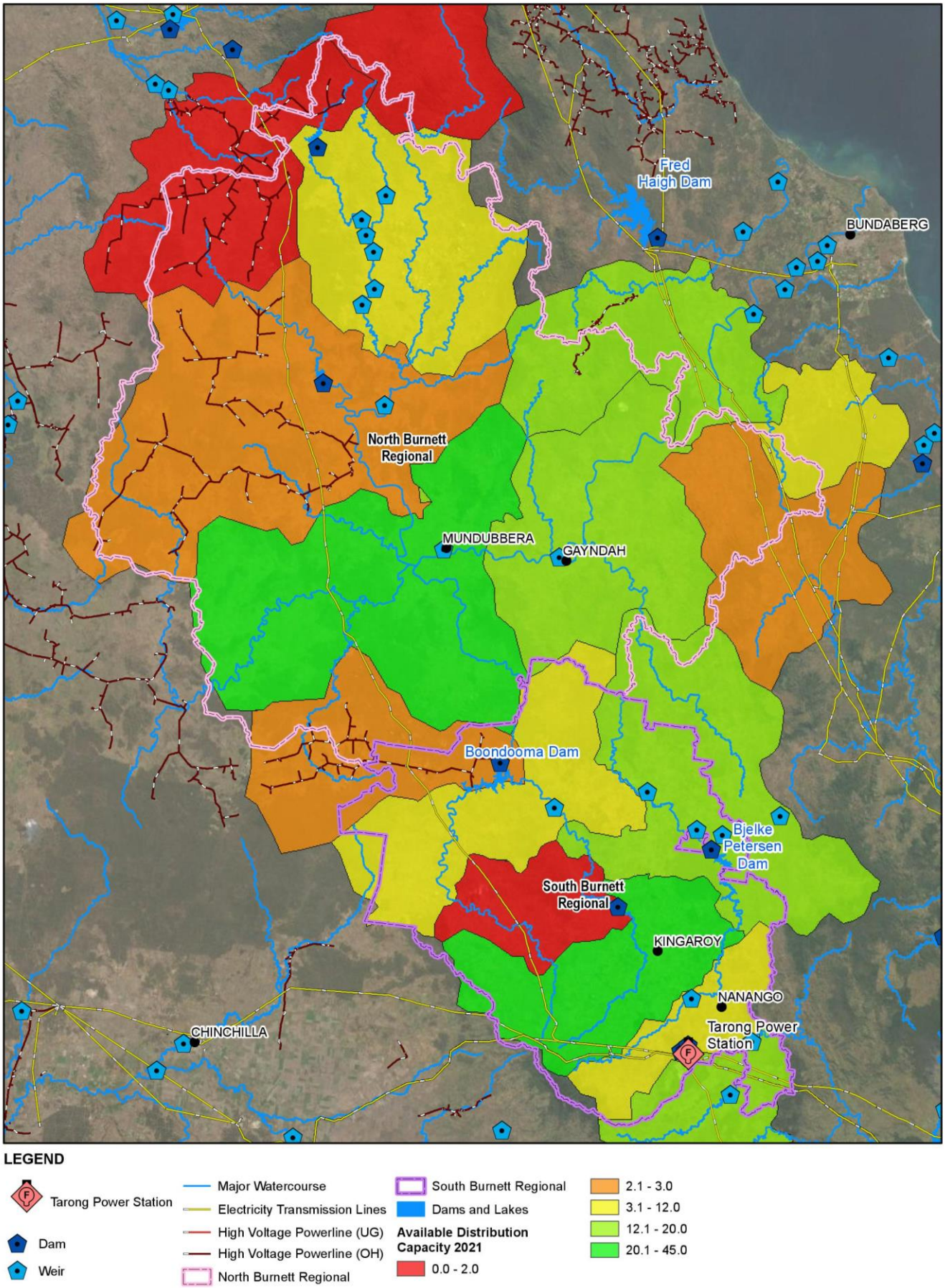
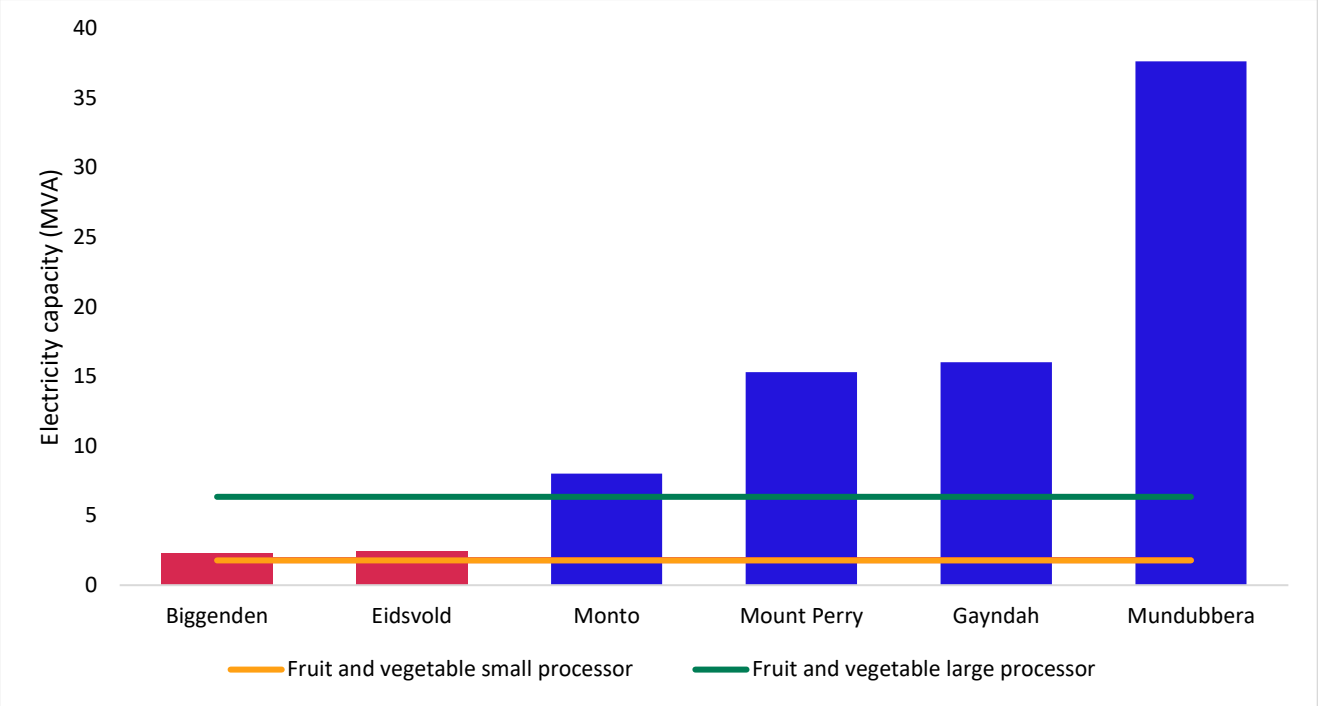


Figure 2.27 : Electricity capacity (MVA)




### 2.1.10 Soil suitability

The Burnett region has good and very good quality soil for agriculture. Individual soil types are assigned to one of five suitability classes for agriculture, ranging from class 1 (highly suitable) to class 5 (unsuitable), depending on the extent to which limitations are present. Because of the coarse nature of this mapping most classified areas contain a mix of classes the specific extent and location of which is unknown until further on ground assessment.

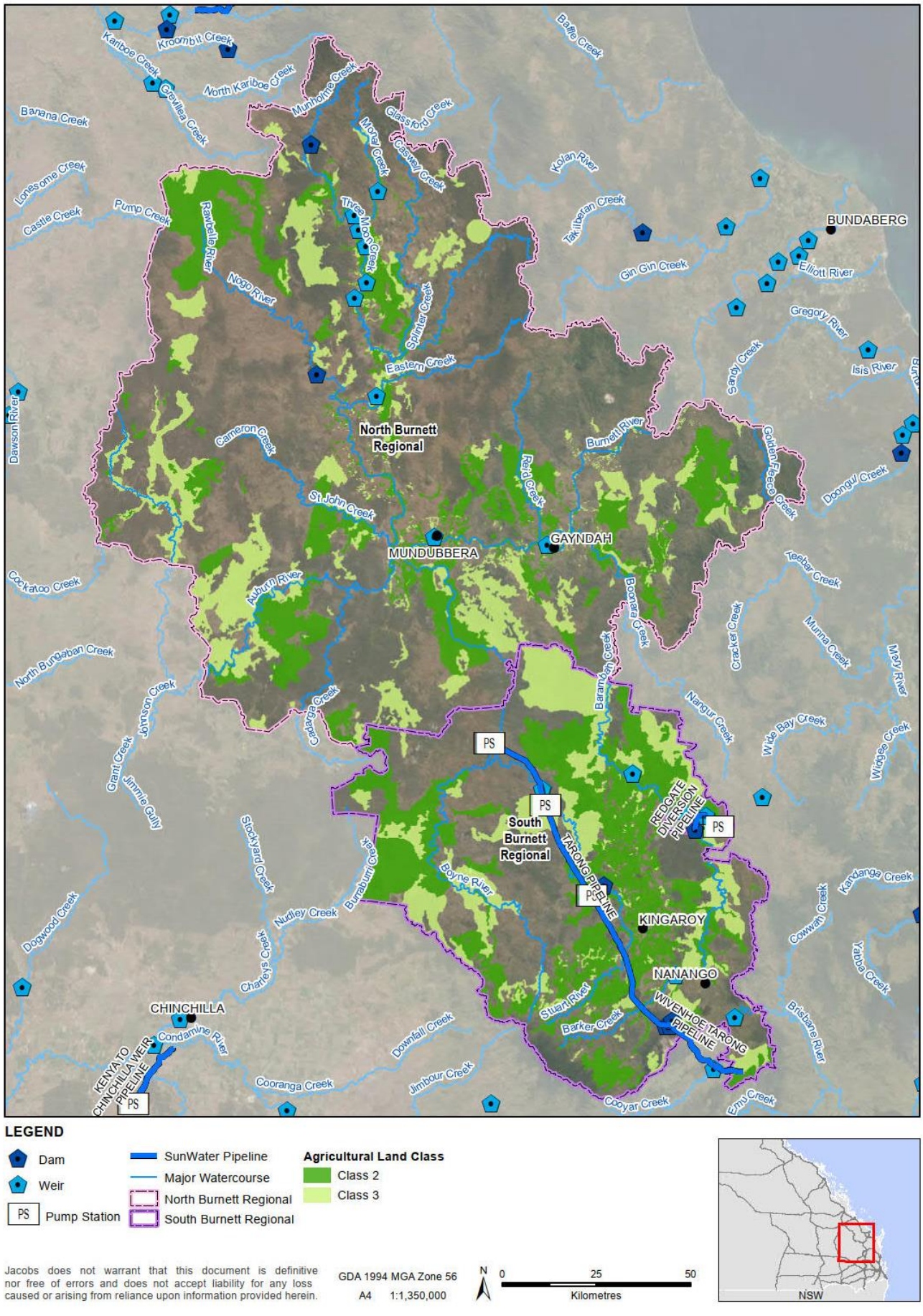
- The North Burnett has 195,406 hectares of at least class 2 and 152,900 hectares of class 3 soil. The very good quality (potentially class 1) soil is around Coalstoun Lakes, Boyne / Mundubbera and St John Creek.
- The South Burnett has 245,819 hectares of at least class 2 and 87,971 hectares of class 3 soil[5]. There is a long stretch of at least class 2 soil that runs along the West of Barker and Barambah creeks.

Across the region, approximately 14,000-36,000 hectares are currently used for irrigation, leaving over 600,000 hectares of at least class 2 (incl. some class 1) and class 3 soil available for irrigation. Funding would be required to map this with higher certainty, including to identify the areas of class 1 soils within those mapped as class 2.

The estimate for current irrigation area is taken from ABS water use and Queensland Government spatial data. The Queensland Government Spatial data looks at past and present land use which includes a greater parcel of land. Whereas the ABS data only accounts for area under irrigation at a certain point in time (e.g. last agricultural census 2016).

[5] *Class 1 is suitable land with negligible limitations. This is highly productive land requiring only simple management practices to maintain economic production. Class 2 is Suitable land with minor limitations and Class 3is Suitable land with moderate limitations.*

Figure 2.28: Soil suitability and water infrastructure in the Burnett region



Several small specific studies have been undertaken to identify class 1 soil, which requires more detailed mapping. These studies identified 3,800 hectares around Kingaroy, 6,000 hectares between Munduberra and Gayndah and 4,000 hectares in Coalstoun Lakes (50 per cent of the studied soil). This describes total land. Most of this land is not irrigated, but a small portion may be.

Table 2.3: Identification of class 1 soils

| Publication | Study area | Key findings |
|---|---|---|
| Soils and Agricultural Suitability of the South Burnett Agricultural Lands, Queensland (2001) | Soils were examined in an area of 126 600 hectares, centred around Kingaroy, north to Mondure and South-west to Mannuem Creek | This study found 3,795 hectares of class 1 soil across the study area.<br>Overall, 53% of the survey area is considered suitable for dryland cropping, 73% is suitable for dryland sown pastures, 48% is suitable for tree and vine crops. Approximately 80% of the study area has been cultivated at some stage. Very little of the original vegetation remains intact.<br>Soils derived from the deeply weathered basaltic material, predominantly the red soils, account for about 50% of the land suitable for intensive development. |
| Soils of the Riparian Lands of the<br>Burnett River between Mundubbera<br>and Gayndah, Queensland (1996) | Soils were examined up to 5 km north and south from the general course of the Burnett River between Mundubbera and Gayndah. The survey covered 38 890 ha. | In total, 6,000 hectares were found to be class 1 soil.<br>The principal uniform sandy soil is the Burnett soil, which occurs on levees of the Burnett River.<br>This soil is well drained, has a good water holding capacity and is suited to most crops under sprinkler<br>irrigation. The Burnett shallow phase is a moderately deep fine sand overlying clay and is also an important soil for horticulture.<br>A high proportion of land close to the river is suitable for irrigated cropping. |
| Agricultural Land Resource Assessment of Coalstoun Lakes (2000) | Coalstoun Lakes area, 7,655 hectares | A total of 3,900 hectares of class 1 soil was identified within the study area.<br>Over 50% of the area mapped (3995 ha) are Ferrosols developed on basalt. These soils are suited to a wide range of agricultural and horticultural crops. In the remaining area, 25% of the area are soils developed on alluvium and colluvium (1996 ha), soils formed on Biggenden Beds (775 ha) or on a range of geologies with slopes greater than 8%. |

### 2.1.11 Existing water supply allocation and management

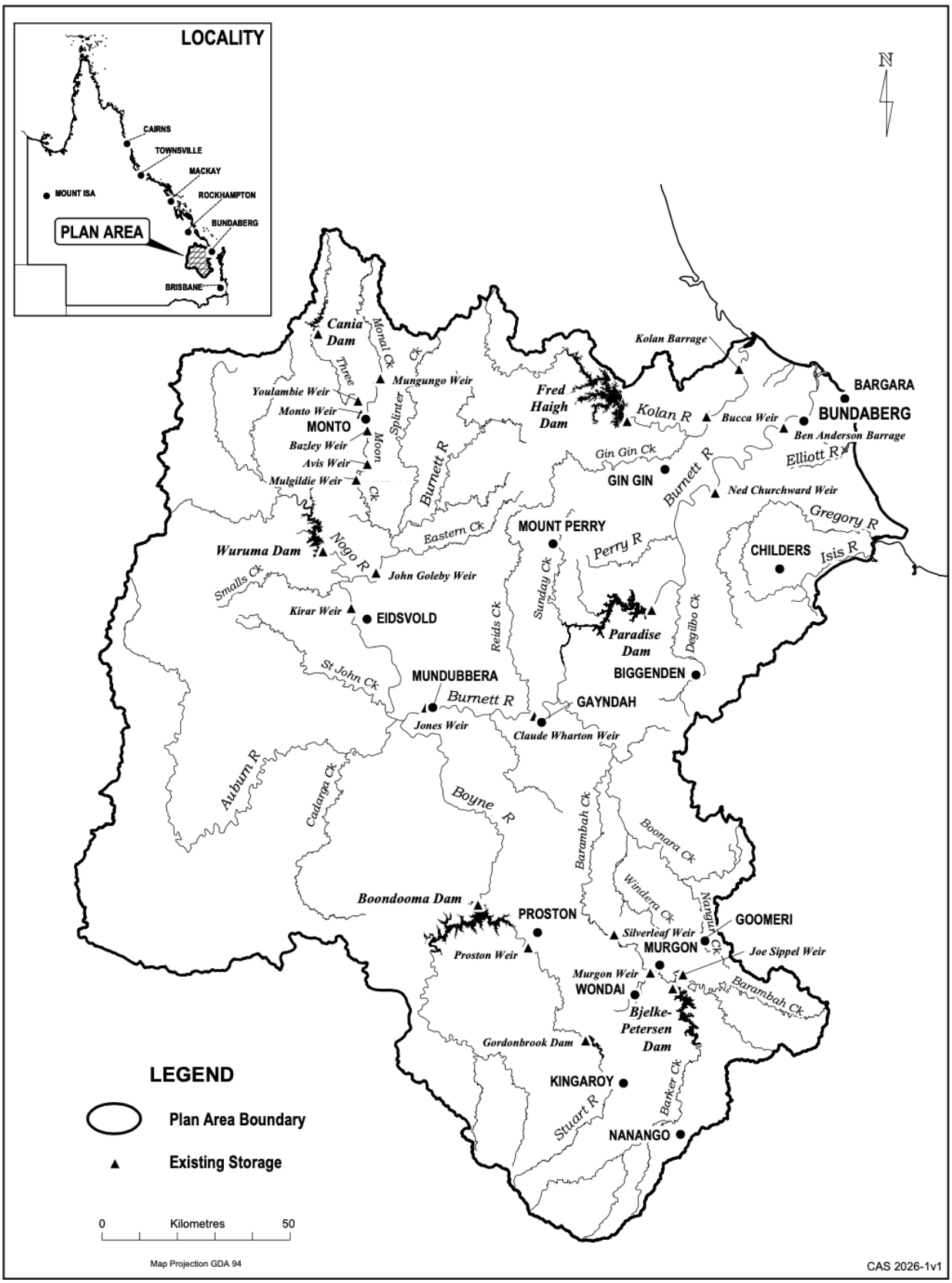
Surface water and groundwater in the Burnett River basin is allocated and managed under the Water Plan (Burnett Basin) 2014 (the 'water plan'). Figure 2.29 shows the area for the water plan.

The plan was last replaced in 2014 and is due to expire on 1 September 2024. A five-year assessment of the water plan was completed in 2019 which identified a number of emerging issues[6] including:

- the interest in accommodating potential new water infrastructure developments within the plan area to address agricultural water demands and water security including Cooranga weir, Claude Wharton Weir (where a bag was decommissioned) as well as NWIDF projects including Gayndah regional infrastructure development (GRID)
- the implications of progressing the Paradise Dam Improvement Program with Building Queensland commencing an expedited assessment of options and reporting back to Government early in 2020. Sunwater are also preparing to commence lowering the spillway as soon as the 2019/2020 wet season is over
- the implications of long-term climate change projections for 2030 which predict an increase in evaporation across the plan area as well as a small decrease in rainfall mainly during the spring months and a small increase in rainfall mainly during the autumn months.

[6] *Minister's Performance Assessment Report of the Water Plan (Burnett Basin) 2014*, Water Policy and Water Services (South Region), DNRME, 2019

Figure 2.29 : Burnett water plan area




*Source: Replicated from the water plan area map presented on Business Queensland website*

### 2.1.11.1 Existing water entitlements

Water users have access to water taken under a water entitlement, using authorised overland flow (OLF) and groundwater works or under a statutory authorisation through the Water Act (e.g. low risk or prescribed activities such as stock and domestic use). These are summarised in Table 2.4. Note that the take of water under the

category of statutory authorisations – such as stock and domestic take, overland flow water interference, and various prescribed activities – is typically not measured in the Burnett Basin. Departmental monitoring suggests that the quantum of take of overland flow water in the basin is considered to be small and rate of the development of new offstream storages is considered a low risk to the outcomes of the water plan.

Table 2.4 : Summary of existing water entitlements in the Burnett Basin

| Entitlement Type | Entitlement numbers | | | | Entitlement | |
|---|---|---|---|---|---|---|
| | All | Volumetric | Area | Other | Volume (ML) | Area (ha) |
| Surface Water Licences | 775 | 184 | 352 | 239 | 25,467 | 0 |
| Underground water Licences | 270 | 259 | 0 | 11 | 35,274 | 0 |
| Supplemented Surface Water Allocations | 4633 | 4633 | 0 | 0 | 493,848 | 0 |
| Unsupplemented Surface Water Allocations | 439 | 439 | 0 | 0 | 48,344 | 0 |
| Unsupplemented Underground Water Allocations | 758 | 758 | 0 | 0 | 62,326 | 0 |
| Interim Water Allocation | 127 | 127 | 0 | 0 | 14,586 | 0 |

*Source: Replicated from Appendix B, Table 7 of Minister's Performance Assessment Report of the Water Plan (Burnett Basin) 2014*

Sunwater operates five water supply schemes in the region. There is a large amount of uncommitted water in the Bundaberg scheme. However, the current safety review of Paradise Dam may reduce this amount.

Table 2-5 : Availability of water allocations

| Water Supply Scheme | Total water storage capacity (ML) | Water allocations held by customers (ML) | Uncommitted water allocations (ML) |
|---|---|---|---|
| Barker Barambah | 136,190 | 33,512 | 803 |
| Boyne River and Tarong | 204,200 | 41,785 | 0 |
| Bundaberg[1] | 937,420 | 209,978 | 128,831 |
| Three Moon Creek | 89,328 | 14,734 | 0 |
| Upper Burnett | 188,439 | 40,985 | 7,565 |

*Source: QBWOS (2018). Note (1) This is subject to an ongoing investigation regarding Paradise Dam and currently subject to 399B notice under Water Supply Safety and Reliability Act. Refer Section 2.1.10.2*

### 2.1.11.2 Paradise Dam

Paradise Dam is a 52-metre-high roller compacted concrete (RCC) dam located approximately 80 kilometres south west of Bundaberg on the Burnett River. It was built in 2005 to store 300,000 ML and supply water to irrigators and urban communities around Bundaberg. Sunwater owns and operates the dam.

In 2013 a flood event resulted in scour downstream of the primary spillway, requiring Sunwater to undertake dam repair and strengthening works. Sunwater completed flood repair works in 2013, and undertook detailed dam safety reviews, risk assessment investigations, and associated studies.

Sunwater also carried out early stage dam improvement works from 2015 to 2017 to strengthen the base of primary spillway monoliths and reviewed and implemented improved emergency planning and response measures from 2015 to 2018 (and ongoing).

Through this process, Sunwater commissioned further geotechnical investigations, a revised dam stability assessment, and peer review by national and international experts. These investigations identified, whilst the dam is considered safe under normal conditions, there is an increased risk of dam failure should an extreme flood like the 2013 event occur again.

In response, the Queensland Government announced Sunwater would reduce the water level of Paradise Dam ahead of the 2019-2020 wet season and commence works to reduce dam safety risk. In the same announcement, Government requested that Building Queensland complete a report to assesses long- term options for the dam to ensure water security for the region for future economic growth and to maintain community safety.

Building Queensland considered options including maintaining the spillway at the current height, lowering the spillway between five and ten metres and decommissioning the dam. Building Queensland recommended, amongst other things, that a Detailed Business Case investigate the preliminary design and cost estimates for:

- maintain the primary spillway height at the level of the essential works (nominally 5 metres below the existing spillway level prior to essential works)
- raise the primary spillway height to an optimal level (up to the existing spillway level prior to the essential works) and explore alternative water supply options
- lower the primary spillway height to an optimal level (down to a maximum of 10 metres below the existing spillway level prior to essential works) and explore alternative water supply options.
- Lowering the spillway by 5 metres reduces the Medium Priority yield by 57,000 ML and lowering by 10 metres reduces the Medium Priority yield by 105,000 ML.

Building Queensland also undertook a scan of alternative water supply options that might be able to return water supply to the Bundaberg Water Supply Scheme and to the broader Burnett area. The initial water supply options identified by Building Queensland include:

Table 2.6: Options identified by Building Queensland

| North Burnett | South Burnett | Bundaberg |
|---|---|---|
| Jones Weir – 1.4 m raising | Barlil Weir | Bucca Weir – 1.5m raising |
| Claude Wharton Weir – 2m raising | Boonara Dam | Ned Churchward weir – 2m raising |
| Auburn River Weir | | Gregory River Dam |
| Mt Lawless Offstream storage | | Ned Churchward offstream storage |
| Reids Creek Dam | | |
| Cooranga Weir | | |
| Deglibo Creek Dam | | |
| Kaliwa Dam | | |

While some of these options are relevant to this study, the Queensland Government has indicated that its focus will be on returning water to the Bundaberg WSS or areas where Paradise could have benefited, in accordance with demonstrated need and demand for water. This will need to consider the assessment of likely demand for water in the area with a view to consider alternative water supply options that would align with the demand and needs assessment undertaken by Building Queensland in as far as volume, timing and location. Further consideration of alternative water supply options will be undertaken by Queensland Government and Sunwater as further stages of the assessment of Paradise Dam long term future occurs.

The possibility of securing some of the Paradise Dam water supply will be considered in the assessment of the relevant options in this study. However, due to the uncertainty of how the Paradise Dam water supply will be allocated, this study will identify other relevant water supplies, including the substantial amount of unallocated water within the water plan. If the viability of an option is entirely reliant on water supply from Paradise Dam, that will impact on the assessment in this study.

#### 2.1.11.3 Unallocated water

Section 36 of the water plan provides for strategic, strategic water infrastructure, and general unallocated water reserves in the Burnett Basin. There is 25,845ML of nominal volumes of supplemented water available in the strategic water infrastructure reserve made up of:

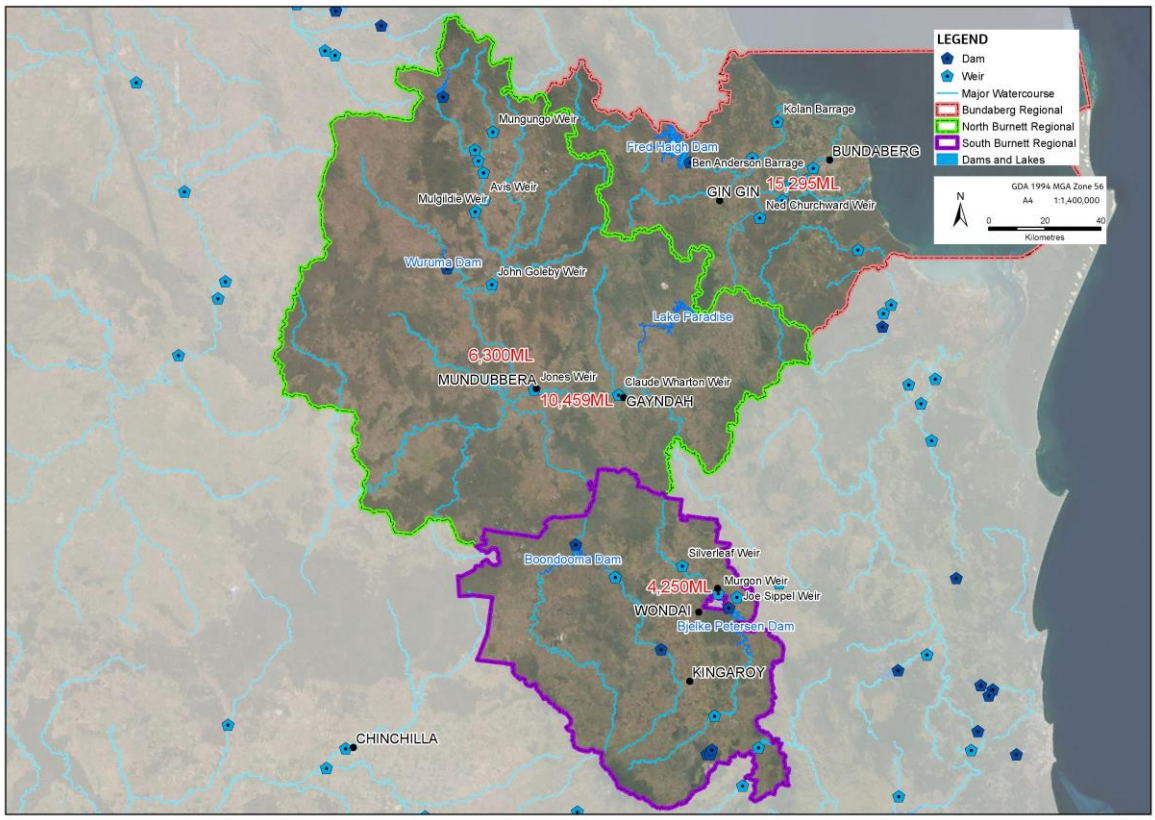
- up to 4,250 ML for water infrastructure on Barambah Creek within the boundaries of the Barker Barambah water supply scheme
- up to 15,295 ML for water infrastructure on the Burnett River within the boundaries of the Bundaberg water supply scheme
- up to 6,300 ML for water infrastructure on the Burnett River within the boundaries of the Upper Burnett water supply scheme.

In addition, there is 10,469 ML of medium priority water allocation held by Burnett Water Pty Ltd in the Upper Burnett water supply scheme that are presently not able to be supplied with water. These are currently excluded from the water sharing rules in the Upper Burnett Water Supply Scheme Operations Manual as a result of Sunwater's decommissioning of the fabri-dam at Claude Wharton Weir. This means that no water may be made available or supplied to these water allocations pending reinstatement of water storage in the scheme through, for example, the construction of a new raised gated structure on Claude Wharton Weir to replace the decommissioned fabri-dam.

The water plan effectively caps the total volume of water that may be allocated in the basin i.e. existing water entitlements plus new entitlements that relate to planning provisions including additional volumes of unallocated water reserves specified in the water plan.

The figure below shows the volume of water in the plan that can be provided, subject to infrastructure being built. The numbers (in red) indicate the general area where the infrastructure could be built, but there is some capacity to move within relevant water supply scheme. While not within the study area, Bundaberg Regional Council is shown as it is part of the Burnett Basin and what happens in Bundaberg has implications for the project.

Figure 2.30 : Available water within the water plan




### 2.1.12 Availability of supplemented water

The availability of water is of critical importance to water users in each scheme. The reliability of a product – as described in section 2.2.2 below – relates to a water entitlement's long-term access to available water supplies and has a bearing on what the water is actually used for. For example, an urban water user will require a high reliability product to minimise the risk of an interruption to urban water deliveries.

Within the irrigation industry, different customers will require different levels of reliability to manage their risk. For example, an orchard is likely to require a high reliability product to ensure that permanent planting survives. Alternatively, some irrigators can manage the risk of a lower reliability product, which has greater variability.

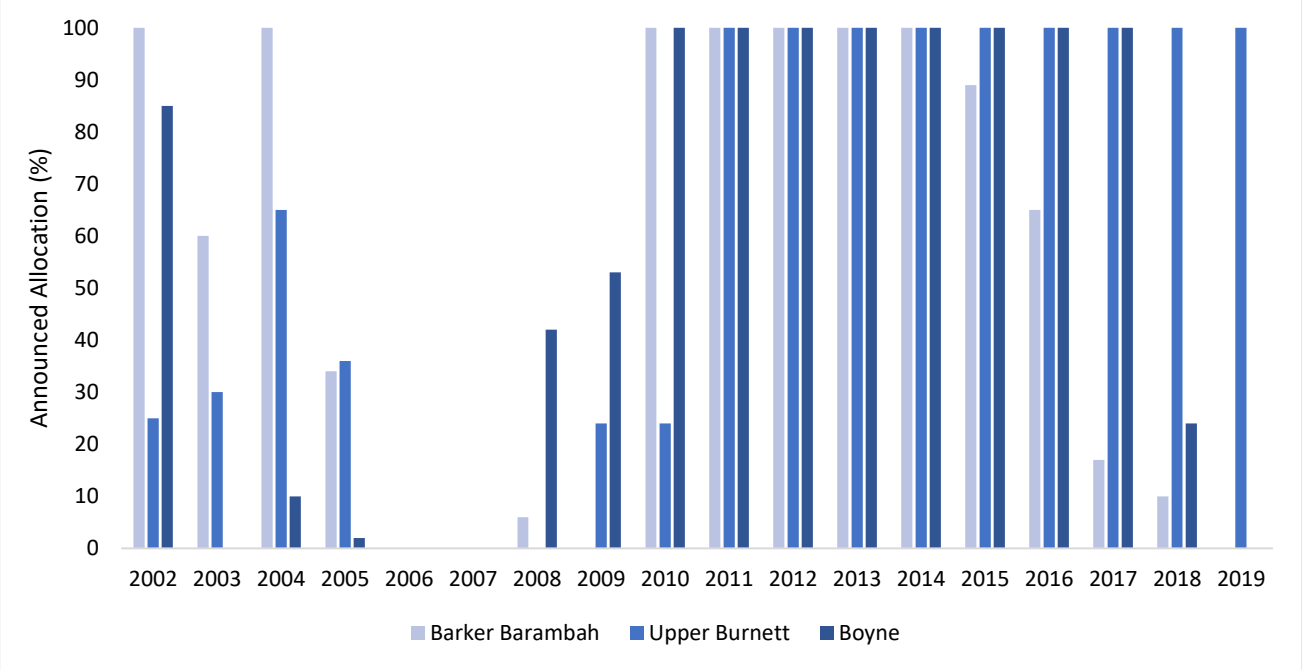
The data on the historical availability of Sunwater schemes within and near the region show reasonable access to water in each scheme since 2010. However, there was a prolonged period during which the announced allocation was substantially reduced.

Within the North and South Burnett there are four key Sunwater run water supply schemes which support agricultural development and irrigation.

- Boyne River and Tarong Water Supply Scheme
- Barker Barambah Water Supply Scheme
- Upper Burnett Water Supply Scheme
- Three Moon Creek Water Supply Scheme.

The announced allocation of water allocations in the region are shown in the figure below.

Figure 2-31 : Announced allocation (start of year) for Water Supply Schemes with a ROL




*Note: Announced allocation shown for 1 July in each year and may have increased during the year.*

The Boyne River and Tarong scheme and the Barker Barambah schemes have the lowest average announced allocation over the past 20 years and are described further below.

**Boyne and Tarong water supply scheme**

The Boyne River and Tarong water supply scheme is supplied by the 204,000 ML concrete-faced rockfill Boondooma Dam. The dam, which was purpose-built in 1982 to provide water to the Tarong Power Station, is located on the Boyne River near the town of Proston in the South Burnett region. The Tarong Pipeline, which is owned and operated by Sunwater, links the dam to Tarong Power Station.

The dam supplies water to Industrial, irrigation, urban and other users.

Table 2.7: Boyne River and Tarong Water Allocations

| Customer type | High priority water allocation | Medium priority water allocation | Total Water allocation |
|---|---|---|---|
| Tarong pipeline | 29,990 | 0 | 29,990 |
| Other industrial | | 343 | 343 |
| Irrigation | | 9,142 | 9,142 |
| Urban | 1,825 | | 1,825 |
| Other | 480 | | 480 |
| Sunwater | 1,625 | | 1,625 |
| **Total** | **33,920** | **9,485** | **43,405** |

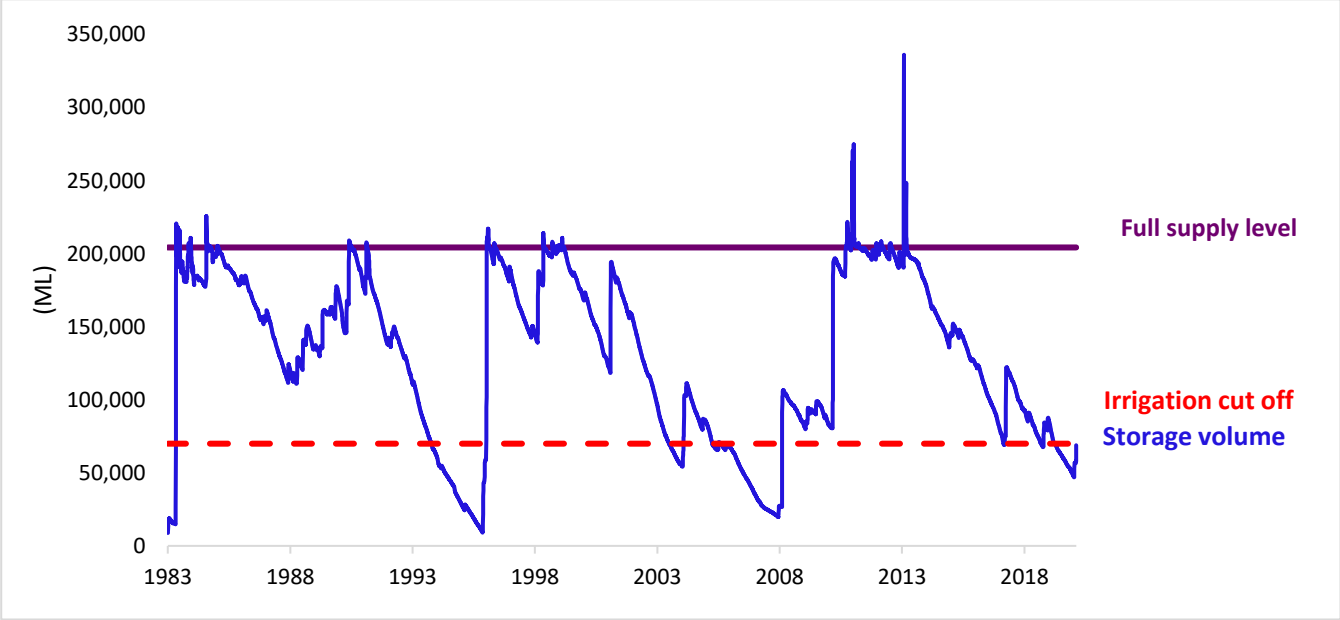
*Source: Sunwater Boyne River and Tarong network Service Plan, 2018t*

Releases are made from Boondooma Dam to meet demands for medium priority water allocation holders downstream of the dam only if the storage level is above 268.67m Australian Height Datum (AHD) which equates to approximately 70,000ML in storage capacity. No releases may be made below this to protect high priority water allocations for town water supplies and power generation. This rule was designed to give priority to maintaining the performance of urban and industrial users over irrigation customers when supplies in the dam are low.

This means that irrigators are not able to be supplied with water from the dam once the volume of the dam falls below 70,000 ML, irrespective of their announced allocation (although during these periods limited access is provided to irrigators to take water from downstream bedsands and water holes).

Figure 2.32 shows that the stored volume has fallen below 70,000 ML several times since the completion of the dam.

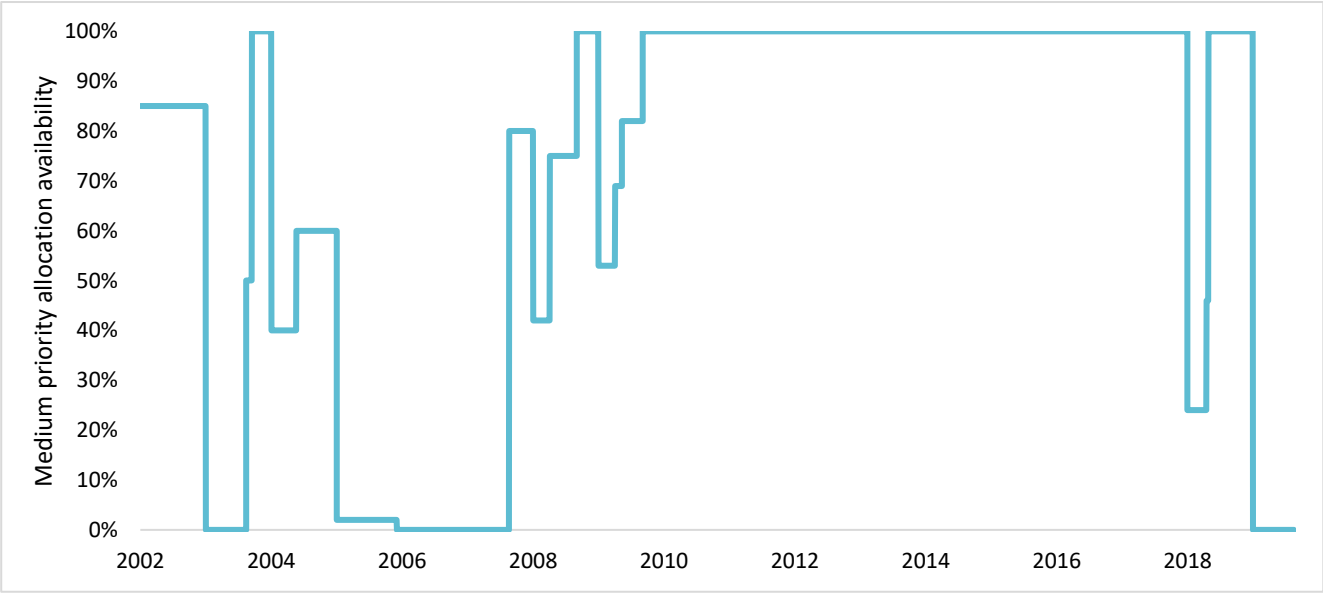
Figure 2.32 : Boondooma Dam volume (ML)




Source: http://www.bom.gov.au/waterdata/

Since 2002, the Dam has been below 70,000 ML 19 per cent of the time. In years where the dam level is near or below the cut-off at the start of the water year, this has resulted in prolonged periods where the announced allocation for irrigators is zero, or very close to zero. High priority water allocation holders have had 100 per cent announced allocation in every year.

Figure 2.33 : Boyne River and Tarong medium priority announced allocations



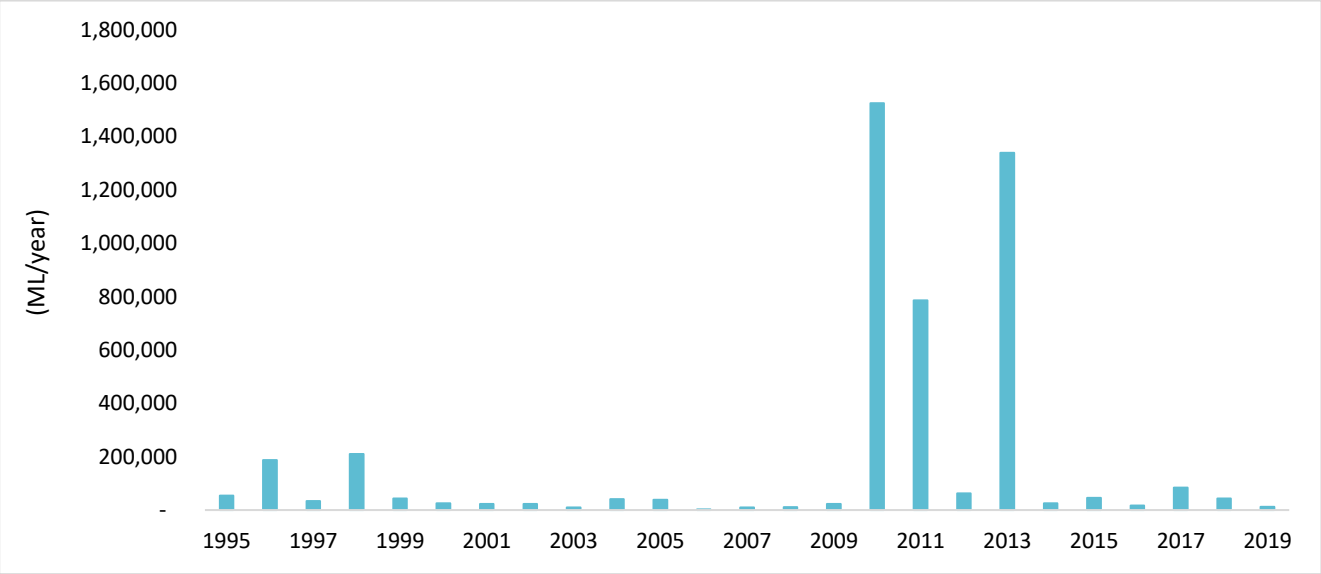

Source: https://www.sunwater.com.au/schemes/Boyne-River-and-Tarong/

The dam is towards the top of the Boyne River catchment and it can take 5 to 8 days for water to travel from the dam to the irrigators. This travel time is due to the 40 km distance between the dam and the first customer. This distance and time results in high transmission losses, and cancelled orders as it can rain between ordering and delivery. However, the travel time can vary depending on the flows in the river and the rate of water being released.

There are several inflows downstream of the dam that are not captured in the Boyne River. These inflows into the Boyne River, then flow into the Burnett River. A re-regulating weir on the Boyne River could capture these flows, which would result in less water flowing out of the Boyne River into the Burnett River.

The average volume is 187,000 ML per annum. However, if the three largest years are excluded, then the average volume is 47,000 ML per annum, with a minimum of 2,272 ML in 2006. However, it should be noted that these flows are influenced by dam releases and irrigators taking water.

Figure 2.34: Historical River Flows (ML/year) – Boyne River at Cooranga




*Source: Queensland Government, water-monitoring.information.qld.gov.au*

**Barker Barambah water supply scheme**

The Barker Barambah scheme is supplied by the Bjelke-Petersen Dam, near Moffatdale in the South Burnett, which captures the flows of Barker Creek, Four Mile Creek, Six Mile Creek, Frickey Creek and Cattle Creek to create Lake Barambah. Water is supplied primarily for irrigation, with some urban supply.

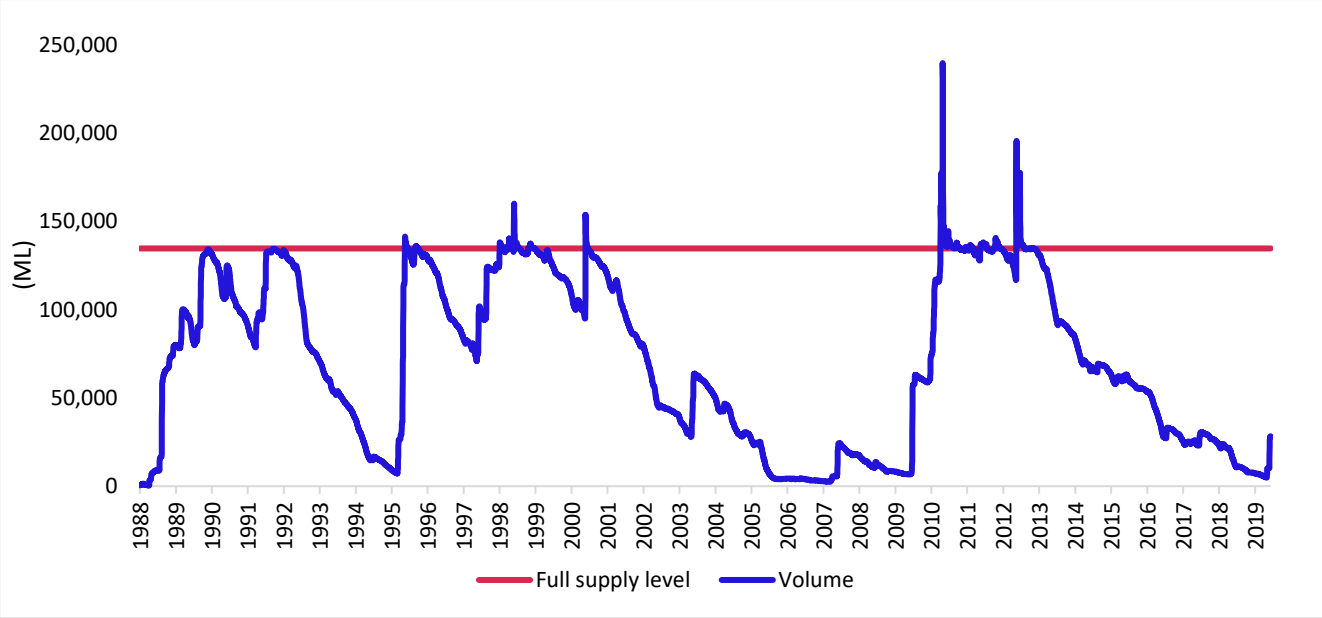
Table 2.8: Barker Barambah Water Allocations

| Customer type | Priority | Water allocation |
|---|---|---|
| Urban | High | 2,115 |
| Irrigation | Medium | 31,361 |
| Sunwater | High | 839 |
| **Total** | | **34,315** |

*Source: Sunwater 2018-19 annual report*

The water made available for consumptive use depends on the volume of water stored in the dam. The volume of water stored is shown in Figure 2.35.

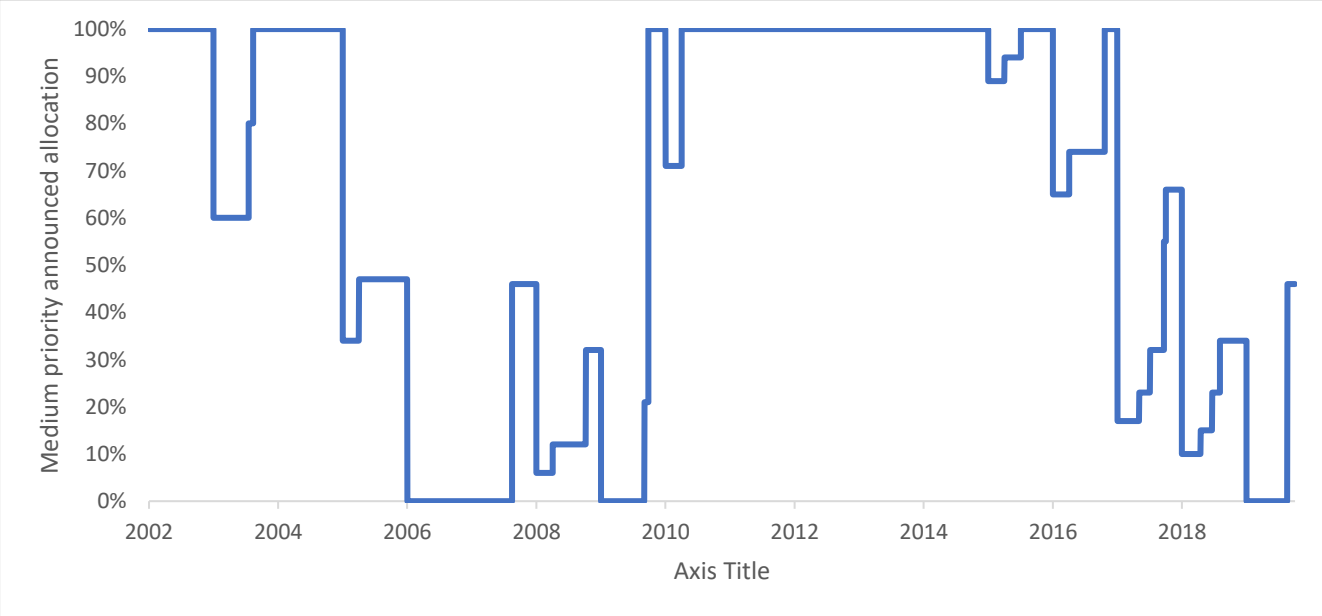
Figure 2.35 : Bjelke-Petersen Dam volume (ML)




*Source: http://www.bom.gov.au/waterdata/*

Medium priority (irrigation) announced allocations have been unreliable, with several periods of very low, or no water available.

Figure 2.36: Barker Barambah – Medium Priority Announced Allocation History




**Upper Burnett water supply scheme**

The Upper Burnett water supply scheme is supplied by the 165,000 ML Wuruma Dam located on the Nogo River a tributary of the Burnett River. Other main storages in the scheme include:

- John Goleby Weir
- Jones Weir
- Claude Wharton Weir

The scheme supplies water to irrigate some 4,450 ha of land along 165 km of the Burnett River and delivers urban water to the towns of Eidsvold, Mundubbera and Gayndah. There are also small industrial water users within the scheme.

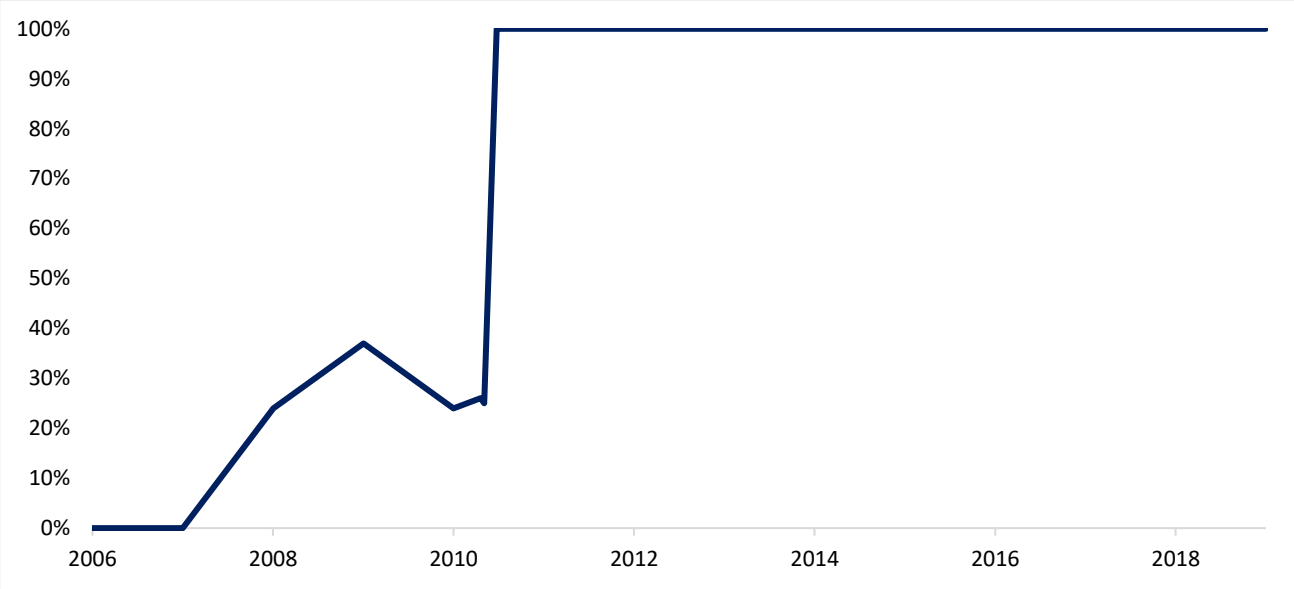
Table 2.9: Upper Burnett water allocations

| Customer type | Priority | Water allocation |
|---|---|---|
| Urban | High | 1,630 |
| Irrigation | Medium | 28,769 |
| Industrial | Medium | 119 |
| Sunwater | Medium | 18,032 |
| **Total** | | **48,550** |

*Source: Sunwater 2018-19 annual report*

Medium priority (irrigation) announced allocations have been relatively reliable. However, there was a period between 2006-2010 where the announced allocation was very low with small periods of no water available.

Figure 2.37: Upper Burnett – Medium Priority Announced Allocation History




**Three Moon Creek water supply scheme**

The Three Moon Creek water supply scheme is supplied by the 89,000 ML Cania Dam 37 km north-west of Monto. Releases from the dam are made to recharge groundwater reserves which supply the majority of customers in the scheme. Other main infrastructure in the scheme includes:

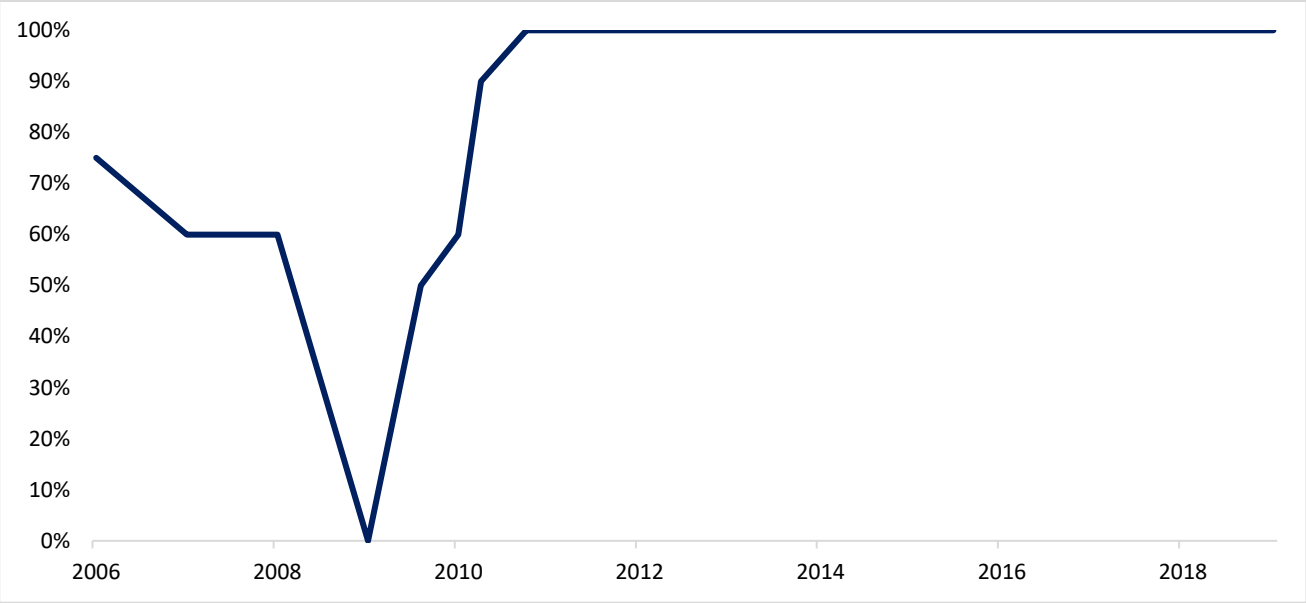
- Avis Weir
- Bazley Weir
- Monto Weir
- Mulgildie Weir
- Youlambie Anabranch Weir
- Youlambie Weir

Table 2.10: Three Moon Creek water allocations

| Customer type | Priority | Water allocation |
|---|---|---|
| Urban | High | 410 |
| Irrigation | Medium | 14,124 |
| Government | Medium | 200 |
| **Total** | | **14,734** |

Medium priority (irrigation) announced allocations have been relatively reliable. However, there was a period between 2006-2011 where the announced allocation was very low with small periods of no water available.

Figure 2.38: Three Moon Creek – Medium Priority Announced Allocation History




### 2.1.13 Irrigation water use efficiency

There have been several programs to improve water use efficiency. These programs tend to focus on specific industries, rather than regions. However, two relevant programs are shown below:

Table 2.11: Summary of water use efficiency programs

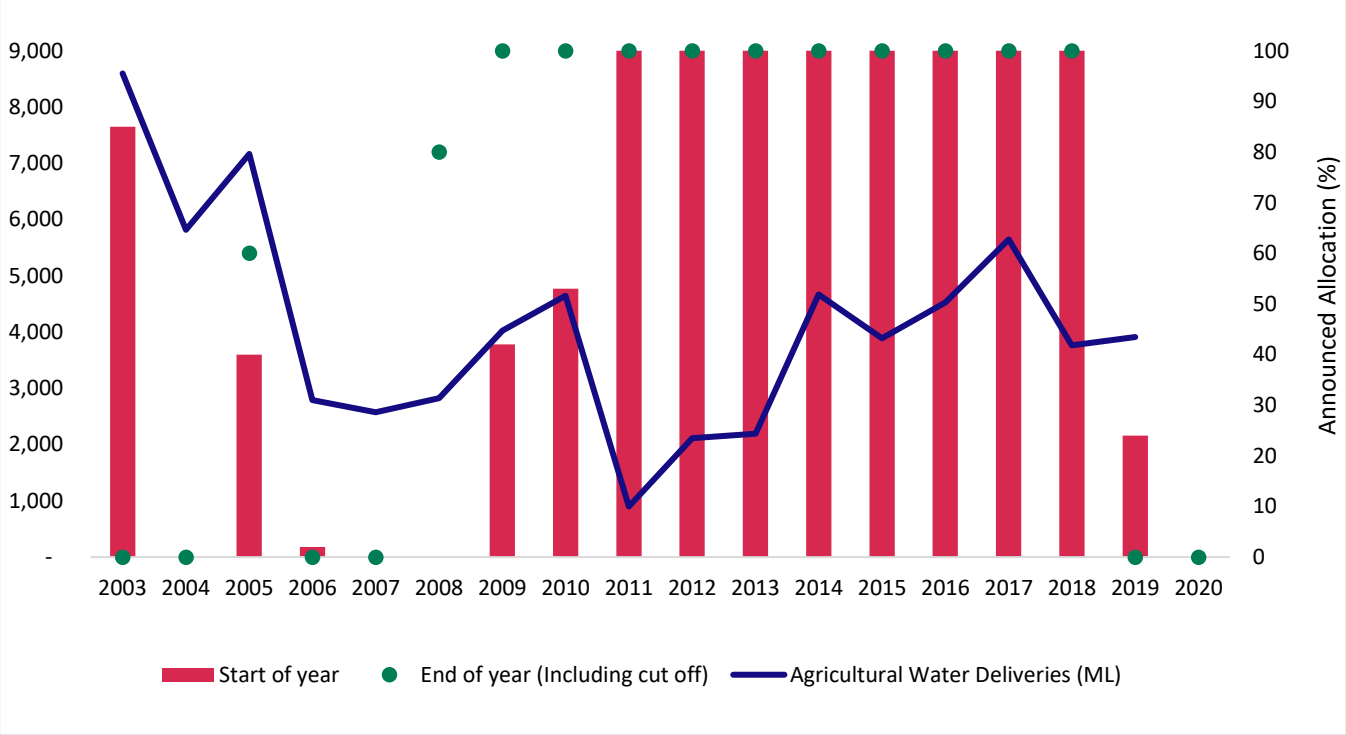
| Project | Description | Source |
|---|---|---|
| Rural Water Use Efficiency Phase 4 2010 - 2013 | RWUE4 has been a successful intervention program. The participation rate was high and in many cases all known irrigators were contacted about taking part in the program. Whilst the data is not exhaustive, there is evidence that the industry has made ground in achieving more efficient irrigation systems. | Rural Water Use Efficiency Program, Department of Natural Resources and Mines, 2016 |
| Rural Water Use Efficiency for Irrigation Futures | Growcom was provided with $1.2 million to improve productivity and sustainability through irrigation system evaluations, irrigation scheduling and fertigation techniques. | Progress report 2013-16 |

These programs provide some evidence that irrigation practices continue to improve. On-the-ground farm specific investigations found that the scarcity of water has encouraged irrigators to implement water efficiency measures. While further efficiency may be possible, the conclusion reached was that further gains will be incremental at best, and that water is currently being used efficiently.

For example, within the Boyne River and Tarong Water Supply Scheme there are large areas of high value tree and perennial crops such as Mandarins and Blueberries which require significant upfront investment and have high ongoing fixed costs. As they are permanent crops, they cannot tolerate periods without water. Accordingly, in these circumstances, irrigators plan to never to use their full water allocation. Irrigators will forgo expansion, rather than risk losing the investment required for new plantings. This means investment decisions within the scheme are based on the worst year rather than the typical average year.

This can be seen in the data. Between 2014 and 2018, where full water allocations were available and rainfall was typical, irrigators used approximately half of their announced allocation. This is not a sign of underutilisation, but of the cautious approach, as they know that dry times will come and if they plant too much, it will die during the dry times.

Figure 2.39: Boyne River MP announced allocation




Therefore, underutilised entitlements can often be a function of water scarcity within the scheme and the way in which irrigators are responding to this. The more volatile the supply, the more conservative irrigators will be. It doesn't always mean that irrigators are simply not using all their water.

### 2.1.14 Urban water security

Urban water security in North Burnett is generally acceptable, although there are short-term water restrictions in place in the townships of Biggenden and Mt Perry. Urban water security in South Burnett is of significant concern, with water restrictions in place across the South Burnett since March 2017. The water restrictions materially impact the availability of water for residents and businesses in South Burnett.

Table 2.12: Current water restrictions[7]

| Town | Region | Water Supply | Restriction | When introduced | Link to restriction description |
|---|---|---|---|---|---|
| Biggenden | North | • Two groundwater bores with DNRME 200ML license (not good quality and becoming less reliable)<br>• Surface water from Degilbo Creek (not permanent and not good quality) as a second priority source | Level 3 | 20 January 2020<br>(Level 2 introduced on 16/12/20; Level 1 introduced on 28/08/19) | Urban Water Drought Management Plan - NBRC |
| Eidsvold | North | Burnett River - 200ML High Priority water allocation from Sunwater – Zone OC (two river bores below Kirrar Weir) | Level 0 (No Restriction) | - | Urban Water Drought Management Plan - NBRC |
| Gayndah | North | Burnett River - 850ML High Priority water allocation from Sunwater – Zone NB (Claude Wharton Weir) | Level 0 (No Restriction) | - | Urban Water Drought Management Plan - NBRC |
| Monto | North | Three Moons Creek - 380ML High Priority water allocation from Sunwater (bores from aquifer fed by Cania Dam) | Level 0 (No Restriction) | - | Urban Water Drought Management Plan - NBRC |
| Mt Perry | North | Two groundwater bores at Wolca Reserve | Level 2 | 16 December 2019<br>(Level 1 introduced on 28/08/19) | Urban Water Drought Management Plan - NBRC<br><br>Level 2 - NBRC |
| Mulgildie | North | 90ML GAB license from DNRME (680m artesian bore) | Level 0 (No Restriction) | - | Urban Water Drought Management Plan - NBRC |
| Mundubbera | North | • Burnett River - 320ML High Priority water allocation from Sunwater – Zone OA (Jones Weir) | MO – Permanent Conservation Measures Level | Permanent | Urban Water Drought Management Plan - NBRC |
| Kingaroy | South | • Boondooma Dam in the Boyne River and Tarong Water Supply Scheme (70% of supply) | Level 3 | 15 March 2017 | Level 3 Restrictions - Commercial - SBRC<br><br>Level 3 Restrictions - Residential - SBRC |

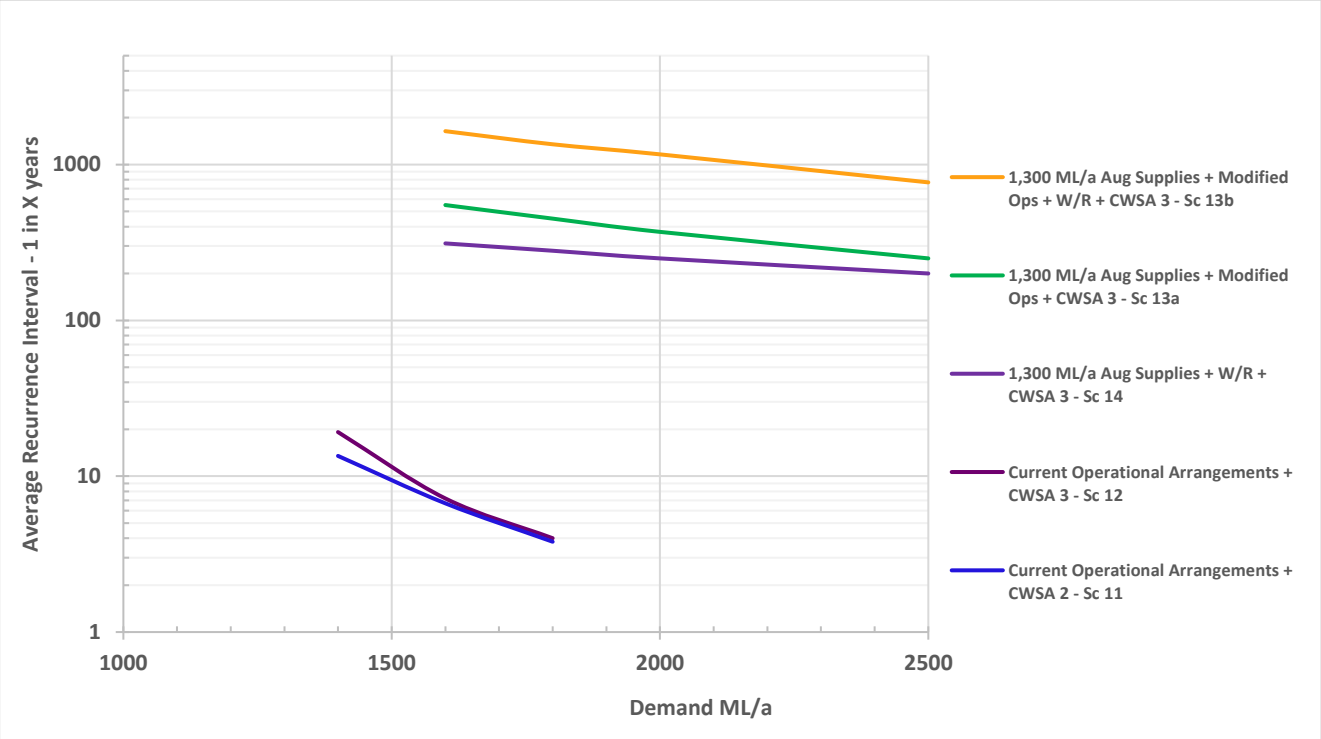
[7] Table 2.10 identifies the current and recent water restrictions in North and South Burnett. Further analysis will be done to identify the trends in water restrictions over time and how they coincide water shortages across the study area.

| Town | Region | Water Supply | Restriction | When introduced | Link to restriction description |
|---|---|---|---|---|---|
| | | • Gordonbrook Dam in the Boyne and Stuart Rivers Water Management Area (30% of supply) | | | |
| Kumbia | South | Kumbia Reedy Creek Borefield | Level 3 | 15 March 2017 | Level 3 Restrictions - Commercial - SBRC<br><br>Level 3 Restrictions - Residential - SBRC |
| Wooroolin | South | Wooroolin Borefield | Level 3 | 15 March 2017 | Level 3 Restrictions - Commercial - SBRC<br><br>Level 3 Restrictions - Residential - SBRC |
| Nanango | South | Nanango Bores A,B,C and Rising Main | Level 3 | 15 March 2017 | Level 3 Restrictions - Commercial - SBRC<br><br>Level 3 Restrictions - Residential - SBRC |
| Blackbutt | South | • Boondooma Dam via the Nukku Pipeline from Tarong Pump Station and Header Tank (primary supply for Blackbutt and Yarraman)<br>• Boobir Dam (backup supply) | Level 3 | 15 March 2017 | Level 3 Restrictions - Commercial - SBRC<br><br>Level 3 Restrictions - Residential - SBRC |
| Wondai Tingoora | South | • Wondai Raw Water Pump Station and Rising Main out of Ficks crossing (primary supply)<br>• Releases from Bjelke-Petersen Dam via Murgon Weir (backup supply) | Level 3 | 15 March 2017 | Level 3 Restrictions - Commercial - SBRC<br><br>Level 3 Restrictions - Residential - SBRC |
| Proston/ Proston Rural | South | Boondooma Dam - Proston Raw Water Pump Station and Rising Main offtake from Boondooma pipeline | Level 3 | 15 March 2017 | Level 3 Restrictions - Commercial - SBRC<br><br>Level 3 Restrictions - Residential - SBRC |
| Murgon | South | • Barambah Creek - Murgon Raw Water Pump Station and Rising Main (primary source) | Level 3 | 15 March 2017 | Level 3 Restrictions - Commercial - SBRC<br><br>Level 3 Restrictions - Residential - SBRC |

| Town | Region | Water Supply | Restriction | When introduced | Link to restriction description |
|---|---|---|---|---|---|
| | | • Releases from Bjelke-Petersen Dam | | | |
| Boondooma Dam Rec Area | South | Boondooma Dam Raw water supply (Boyne River and Tarong Water Supply Scheme) | Level 3 | 15 March 2017 | Level 3 Restrictions - Commercial - SBRC<br><br>Level 3 Restrictions - Residential - SBRC |

Community consultations, and analysis by the SBRC, has identified concerns regarding the quality and suitability of water for residential uses in Murgon and Kingaroy.[9] Table 2.10 identifies that the townships in North and South Burnett draw water from multiple different primary water sources that have varying water security and reliability. Multiple townships rely on allocations from Boondooma Dam, which contributes to the stress on that water storage. The primary water source for Kingaroy is Boondooma Dam (70% of Kingaroy's supply) and Gordonbrook Dam (30% of Kingaroy's supply), which has substantive urban water quality issues when the dam level is low. Without an increase in supply, Kingaroy has a modelled recurrence interval of being unable to meet demand of one year in four.

Figure 2.40: Average Recurrence Interval of Kingaroy Water Supply




### 2.1.15 Future water supply availability

The Water Plan (Burnett Basin) 2014, outlines the volume and conditions associated with the general reserve, strategic reserve and strategic water infrastructure reserve. On 17 July 2019, amendments to the Water Act 2000 came into effect that allow temporary access to unallocated water held as strategic water infrastructure reserves under a temporary water license for up to three years.

[9] *Drinking Water Quality Management Plan (DWQMP) report 2018-2019, South Burnett Regional Council, 2019*

### 2.1.16 Future water demand

Several assessments have been undertaken recently that have included an agricultural demand assessment as a component. Some of the studies identified future demand based on available soils. However, as demand for water is linked directly to price, these studies can provide an upper limit of potential demand, but a more detailed assessment would be required to establish the demand at the relevant price.

A summary of all existing relevant demand reports and studies is tabled below.

Table 2-13 Historical demand reports and studies

| Study | Details |
|---|---|
| Soils of the Riparian Lands of the Burnett River between Mundubbera and Gayndah, Queensland (1996) [(a)] | The principal uniform sandy soil is the Burnett soil, which occurs on levees of the Burnett River. This soil is well drained, has a good water holding capacity and is suited to most crops under sprinkler irrigation. The Burnett shallow phase is a moderately deep fine sand overlying clay and is also an important soil for horticulture.<br>Cracking clays occur on relict alluvia, basalt and sedimentary rocks. Most of these soils are suited to a wide range of field crops with some areas suited to vegetable crops.<br>Extensive areas that are suitable for irrigation include (some soils have suitability for several crops):<br>A total of 7,990 ha is suitable for asparagus, 950 ha for avocado, 2,035 ha for chickpea, 3,553 ha for citrus, 7,990 ha for cruciferae and cucurbits, 7,338 ha for grapes, 3,433 ha for lucerne, 950 ha for mango, 2,112 ha for mungbean, 4,192 ha for navybean, 14,861 ha for pastures, 2,262 ha for peanut, 3,689 ha for pecan, 2,269 ha for potato, 5,539 ha for safflower, 4,976 ha for soybean, 3,689 ha for stone fruits, 8,237 ha for summer grains, 5,523 ha for sunflower, 8,037 ha for vegetables and 8,075 ha for winter grains. |
| Agricultural land resource assessment of Coalstoun Lakes (2000) [(b)] | A total of fifteen different soils were identified and their distribution mapped. The dominant soils are black and grey cracking clays (Vertosols) and non-cracking red clay soils (Ferrosols), red and brown structured gradational soils (Dermosols) and sodic texture contrast soils (Sodosols).<br>Extensive areas that are suitable for irrigation (some soils have suitability for several crops):<br>A total of 6,290 ha suitable for sugarcane, 5,793 ha for asparagus, cruciferae and vegetables, 5,713 ha for beans, 5,793 ha for cucurbits, 4,190 ha for lucerne, 5,580 ha suitable for navybean and potato, 4,596 ha for sorghum, 4,418 ha for soybean, 4,596 ha for sweet corn, 5,660 ha for sweet potato, 6,281 ha for avocado, macadamia, citrus, lychee and mango, 4,325 ha for grapes, 4,289 ha for stonefruit, 4,781 ha for peanuts, 4,596 ha for maize and 6,591 ha for pasture. Furrow irrigation of sugarcane is suitable on only 1,284 ha of land. |
| Bundaberg Channel Capacity Upgrade feasibility study (2018)[(c)] | The Bundaberg Channel Capacity Upgrade feasibility study examined demands across the Burnett – Wide Bay region, focusing mainly on areas potentially serviceable by Paradise Dam water.<br>Sunwater Limited as agent for Burnett Water Pty Ltd issued an invitation to tender (ITT) to market on 14 September 2018 for the purpose of calling for tenders to purchase water allocations, water supply services and the taking of water distribution services.<br>At the time of the ITT there was 111,215ML of Medium Priority water available and this was offered to buyers at a fixed price of $550 per ML (ex GST) – the previous shelf price was $955 per ML. The total volume of water allocations purchased was 11,401ML at $550 per ML, well short of the 111,215ML made available to market.<br>Sunwater received 51 offers. Low volumes were sought compared to the total available allocation. |
| Gayndah Regional Irrigation Development (GRID) project detailed business case (2018) | Several of the new demand areas are within the Burnett region. This includes Coalstoun Lakes, which is being developed by a group of Coalstoun Lakes farmers presently growing broadacre crops such as peanuts and maize. The area may be prospective for tree crops.<br>The GRID project detailed business case explored developing new cane lands in the Gayndah region to leverage suitable soils and under-utilised water resources.<br>The GRID project would involve:<br>▪ the transfer downstream of unused water allocations from further upstream on the Burnett River<br>▪ accessing the existing Strategic Water Infrastructure Reserve assigned to the Upper Burnett system as a new water harvesting product<br>▪ reinstating the previous 1.5 m raising of the Claude Wharton Weir full supply level by installing crest gates |

| Study | Details |
|---|---|
| | ▪ installation of a major pump station adjacent to the Burnett River at AMTD 184 km (approximately) and pumped main delivering water to a 10,000 ML (approximately) off-stream storage<br>▪ installation of 42 km of pipeline and associated infrastructure to supply water to irrigated cropping<br>▪ making available approximately 24,000 ML for irrigated crop production<br>▪ development of over 5,000 ha of annual irrigated sugar cane production<br>▪ development of over 1,200 ha of irrigated rotation cropping (including 50% fallow).<br>To be financially viable and offer sustainable water prices for irrigators (in terms of their capacity and willingness to pay), the project will require significant non-recoverable government grant funding—that is, in the order of $170 million. |
| Draft Wide Bay Burnett Regional Organisation of Councils (WBBROC) Regional Water Position Paper (2018) | The volume of water required to irrigate under reduced rainfall and increased evaporation could increase by 23% and more than double current usage within 50 years if the current 90,000 hectares irrigated is increased to 120,000 hectares. |

*Sources: (a) McCarroll, SM & Brough, DM, Agricultural land resource assessment of Coalstoun Lakes, Land Resources Bulletin no. DNRQ00096, Department of Natural Resources, 2000; (b) Tucker, RJ & Sorby, P, Soils of the Riparian Lands of the Burnett River between Mundubbera and Gayndah, Queensland: Suitability for Irrigated Agriculture, Land Resources Bulletin no. DNRQ 96049, Department of Natural Resources, 1996 (c) Sunwater, Bundaberg Channel Capacity Upgrade Feasibility Study, 2018*

### 2.1.17 Economic opportunity of additional water

Many studies have been undertaken that estimate the economic benefits of increased agricultural production due to an increase in water availability. Several of these studies use gross value of production and/or multipliers to estimate the total impact on the region and the State. While these approaches have significant merit from a local perspective, they are not consistent with the requirements of Building Queensland and Infrastructure Australia. These bodies require the estimation of agricultural benefits to be measured using net margins, which is total revenue net of all costs. It is the profit obtained through an additional ML of water.

A recent study undertaken by the Rural Economies Centre of Excellence and Burnett Inland Economic Development Organisation Irrigation found that:

> Increasing irrigation water reliability from the current 73% to a future 88% would have a major economic impact, not just in the Boyne area, but in the whole North Burnett Regional Council area. The multipliers of increased agricultural output (2.32), income (0.54) and employment (0.01) are considerable. The output multiplier means that for every additional dollar of agricultural output in the North Burnett Region (excluding livestock), $1.32 of additional economic output is produced in other economic sectors. Each dollar of increased output from agriculture (excluding livestock), an additional 54c of income is generated across the regional economy. For every $10,000 of additional agricultural sector output (excluding livestock), 1 full time equivalent job is created in the North Burnett economy.
>
> The agriculture (horticulture) industry generates the highest net industry support effects in value added terms out of all industry sectors in the region. For each unit of initial employment in the agriculture sector, caused by increased output, the associated first round employment coefficient is 4.629, which is relatively high. These considerable multiplier effects reflect the close economic linkages between agriculture and other sectors in the regional economy.

Multipliers are typically not favoured for direct project-based assessment and comparison. The preliminary business case will estimate the benefits of each option using accepted project assessment methods such as net margins per ML of agricultural production. The potential wider economic benefits will also be assessed.

### 2.1.18 Tarong Power Stations

The Tarong Power Station is two coal-fired power stations located 45 kilometres south east of Kingaroy in the South Burnett region. Tarong Power Station is comprised of the original Tarong Power Station and Tarong North Power Station. The original Tarong Power Station is a 1400 megawatt (MW) sub-critical facility that is made up of 350 MW unit. Tarong North Power Station is a single 443 MW advanced cycle coal-fired unit that utilises supercritical boiler technology. Tarong North Power Station is located adjacent to the original Tarong Power Station and has a supercritical boiler design that increases efficiency and reduces emissions by using higher steam pressures and temperatures. Both stations are supplied with coal from the Meandu Mine via a 1.5-kilometre conveyor. The stations are water cooled and required a reliable and consistent supply of water for operations.

**Water Usage at TPS**

TPS makes use of water for cooling in the production process, cleaning and in general operations of the facilities. TPS use approximately 32,000ML of water each year, although there is some variation in this total water usage due to fluctuations in the operation of the stations.

The water used by the TPS is sourced from Boondooma Dam in the Boyne River and Tarong Water Supply Scheme, Wivenhoe Dam in the Brisbane River Catchment and potentially the Western Corridor Recycled Water Scheme if it is recommissioned. TPS use between 12,000 and 29,000 ML/year from Boondooma Dam and up to 25,000 ML/year from Wivenhoe Dam (or the Western Corridor Recycled Water Scheme). In the recent past, Tarong Power Station has been taking a substantial volume of water from Wivenhoe Dam. However, this should not be considered to be the status quo. The volume of water used from each source determined on the basis of water requirements for the stations, water quality and water levels and availability.

Of the water used by TPS approximately 19,000 ML/year is discharged through cooling tower evaporation and 6,000 ML/year is discharged into Meandu Creek for use by local irrigators.

**Water Infrastructure at the Tarong Power Stations**

TPS has substantial water infrastructure including pipelines, pumping stations and multiple dams for the storage and treatment of water, as shown in Image 1.1 below.

**Pipelines** - water from Boondooma Dam is supplied through the Boondooma-Tarong Pipeline. Water from Wivenhoe Dam (and potentially the Western Corridor Recycled Water Scheme) is supplied through the Wivenhoe–Tarong Pipeline. Boondooma-Tarong Pipeline flows directly into the TPS stations, while the Wivenhoe–Tarong Pipeline flows into the Meandu Creek Dam located at the TPS facility.

**Storage** – the primary water storage at TPS is Meandu Creek Dam, although TPS have multiple other water storages that are used to transition, temporarily store and treat water.

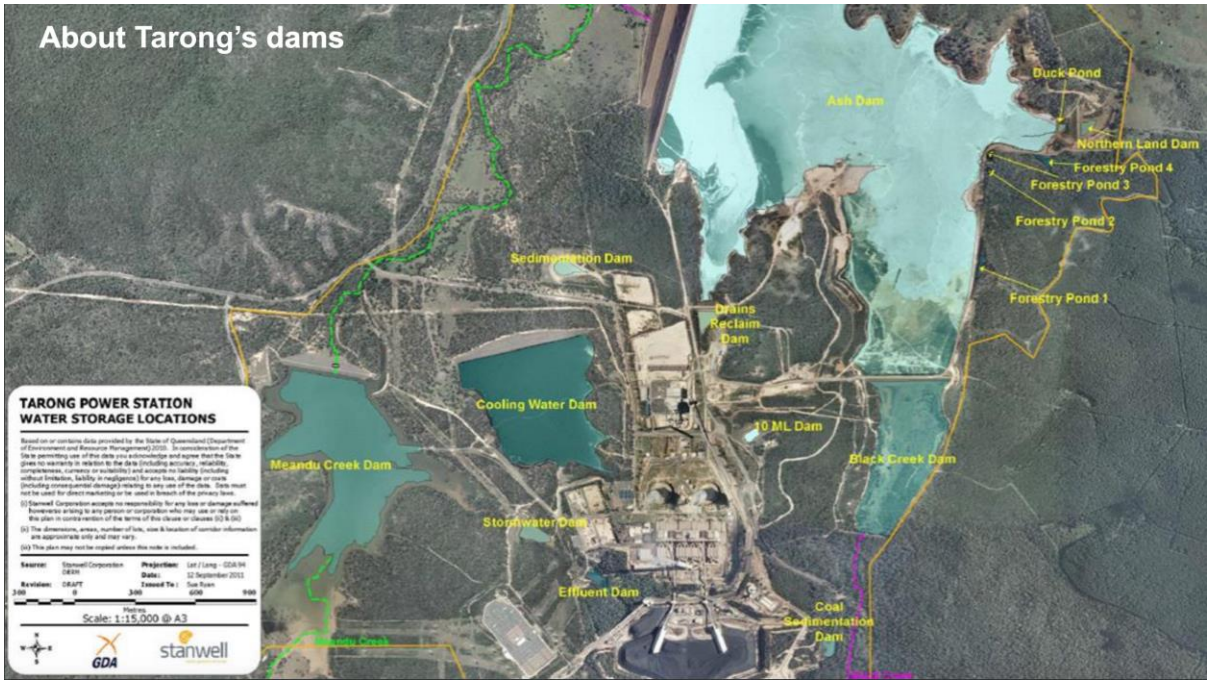
**Future Use of Water Infrastructure**

TPS is scheduled to close and be decommissioned in 2036-37[10], although this scheduled date may be subject to change. At the time that TPS is decommissioned, there is potential for the extensive water infrastructure at the TPS site to be re-purposed for use for alternative urban, agricultural and industrial water uses. There are various considerations regarding the future use of the TPS water infrastructure, including:

- Environment, such as the treatment and management of the Ash Dam
- Energy generation for South-East Queensland, such renewable energy generation that will be planned and built in the region prior to and following the decommissioning of TPS.
- The needs of existing water users on Meandu Creek, represented by the Meandu Barker Creek Water Advisory Committee, who are currently reliant on TPS feeding water into Meandu Creek.

[10] National Energy Market Operator

Figure 2.41: Water Infrastructure at Tarong Power Stations




## 2.2 Review of previous studies

The review of previous studies identified three central, recurring themes:

1) The North and South Burnett regions contain significant environmental, climatological and economic advantages for agricultural and industrial enterprises with associated regional economic benefits

2) Water reliability and security are critical to these enterprises and the region where reliability and water security are described in section 2.2.2 below

3) Previous studies have identified a range of potential solutions for the water challenge in North and South Burnett, including some low-cost initiatives that focus on the better use of existing water resources without the need for large-scale infrastructure development.

As part of the service need investigation, the Project Team undertook a broad literature review of proposals, studies, analysis and data sets relating to the prospective water initiatives and options in North and South Burnett. The Literature Review set out at Appendix A contains a detailed index of the sixty reviewed documents. Part 3 of the Preliminary Literature Review provides a more detailed review of selected documents from the index, including specific proposals that warrant additional description.

The documents reviewed in the Preliminary Literature Review derive from a range of sources, including local and state government reviews, commercial project proponents and academic research. While the Preliminary Literature Review is not a comprehensive collection of every document, proposal or study regarding water options in North and South Burnett, it does provide a good representation of the various analysis and option reviews undertaken in the region.

### 2.2.1 Advantages of North and South Burnett

The Preliminary Literature Review contains multiple studies examining the economic, environmental and climatological features and advantages of North and South Burnett. The highly fertile soils of the region are described in multiple documents. *Soils of the Riparian Lands of the Burnett River, 1996* (**Appendix A, Document 11**) identified a high proportion of land close to the river that is suitable for irrigated cropping, and extensive areas suitable for irrigation some distance from the Burnett River.

The *Agricultural Land Resource Assessment of Coalstoun Lakes, 2000* (**Appendix A, Document 30**) identified significant areas suitable for expanded agricultural production based on soil quality and rainfall around the Coalstoun Lakes area. Multiple studies considered the economic advantages of the region, including proximity to

domestic and international markets, existing transport infrastructure and human resources (*Economic Development and Innovation Strategy*: **Document 12**; *Queensland Regional Profile: South and North Burnett, 2019*: **Document 14**; *Water Transfer and Hydro Storage Study, 2018*: **Document 25**; *Barambah Creek Proposal, 2018*: **Document 28**).

### 2.2.2 Importance of water reliability and security

The role of water reliability and water security was discussed in multiple documents and is a theme across the studies conducted throughout North and South Burnett.

Water *reliability* refers to the portion of time that water demands can be met. It is usually specified in terms of the percentage of months (or, alternatively, years) of a defined historical period (usually 100 or more years) that a specific volume of monthly (or annual) customer water demands that are likely to be fully met by the volume of water available to that customer through the relevant water sharing rules (e.g. through distinguishing between medium and high priority announced allocations).

Water *security* relates to the levels of service that might be expected from a water supply scheme when its surface water reserves become critically low. It is usually specified in terms of the frequency, duration and intensity of water restrictions that might be expected as a result of the long-term hydrologic risk of drought conditions occurring. Security is a concept applied particularly to urban and industrial water during periods of extreme drought and is used in planning for the water infrastructure requirements of urban centres and high priority water users. High value permanent plantings in agriculture may also be focussed on water security.

Regional Water Supply Security Assessment, 2016 (**Appendix A, Document 16**) considered the importance of water security to the economic development of the region. The assessment states that safe, secure and reliable water supplies are critical for sustaining economic growth the well-being of the community. Likewise, Regional Water Strategy Water Synopsis, 2017 (**Appendix A, Document 20**) analysed the current state of water security in the region, and Water for Economic Development, 2018 (**Appendix A, Document 7**) identified security and reliability concerns as a cause of low utilisation of water allocations.

Various commercial projects proposals for North and South Burnett identified the central importance of water reliability to generating economic activity and positive returns on the development of water storage and delivery infrastructure (Getting Water for Peanuts, 2018: **Document 26**; Barambah Creek Proposal, 2018: **Document 28**). The consultations relating the irrigation options on the Boyne River gave considerable attention to the issue of water reliability, including identifying water reliability as a primary benefit of the Cooranga Weir and Boondooma Dam Raising proposals (**Appendix A, Document 34**).

Most users surveyed on the Boyne River were concerned about water reliability (**Appendix A, Document 38**). Irrigation on the Boyne River, 2019 (**Appendix A, Document 42**) concluded that improved water reliability would have positive impacts for the region, including improved efficiency, production improvements, expansion of the production area; and increases in the value to the regional economy.

### 2.2.3 Range of potential solutions for North and South Burnett

Multiple studies in the Preliminary Literature Review considered the prospect of non-build water solutions for the region. The *Regional Water Position Paper, 2018* (**Appendix A, Document 3**) recommends further reviews of regulatory mechanisms, water trading rules, recycled water options and bulk water pricing to address certain challenges in the region. Similarly, *Water for Economic Development, 2017* (**Appendix A, Document 7**) identified that there are substantial water resources in the region that are under-utilised and that water resources are often not cost-effectively available to satisfy the increasing demand for agriculture and high value crops.

A consistent argument throughout the studies was the value in utilising a combination of build and non-build solutions to address the problems relating to the location, reliability and storage of water. The *Bundaberg Channel Upgrade Feasibility Study, 2018* (**Appendix A, Document 13**) examines multiple infrastructure initiatives in the context of refinement to the water trading and pricing mechanisms. The *Regional Water Strategy Water Synopsis, 2017* (**Appendix A, Document 20**) highlighted the importance of the proper allocation and distribution of the region's water resources, while multiple commercial studies advocated for revision to water allocations to support proposed infrastructure projects (*Getting Water for Peanuts, 2018*: **Document 26**;

*Review for Lower Barambah / Coalstoun Lakes Irrigation Scheme, 2015*: **Document 27**; *Sustainable Water Alternatives for the Southern Burnett, 2004*: **Document 57**).

Table 2.14 : Summary of previous studies

| Report title | Date | Description |
|---|---|---|
| Building the future trade potential of the Wide Bay Burnett | | This paper identifies the trade potential of WBBR and identifies the infrastructure priorities to exploit that potential. The paper focuses on transport infrastructure (port, rail, road) and gives limited priority water infrastructure (identified $23m investment in water storage and supply). |
| Cabinet Meeting Minutes – 1 June 1978 | 1978 | Decision to construct 210,000ML dam on Boyne River for power station supply. |
| Cabinet Meeting Minutes – 27 June 1978 | 1978 | Amended the minutes from 1 June 1978 so that the capital costs of the project are apportioned as: Boyne River Dam (QEGB - 75%; IWSC – 25%); and Pumping Station and Pipeline (100% - QEGB). |
| Water Resources Letter May 1980 | 1980 | Letter form the Boyne River Water Advisory Board requesting clarity on the priority for water for irrigators; soil survey of surrounding lands; water requirements for irrigation from the report; and plans for stage two. Response from the Minister confirmed that a percentage of water would be reserved for irrigation although urban and other uses would have a higher priority; advised that stage two would not proceed for a significant period. |
| Soils of the Riparian Lands of the Burnett River | 1996 | The soil assessment identifies that a high proportion of the land close to the Burnett River is suitable for irrigated cropping, and that there are extensive areas suitable for irrigation some distance from the Burnett River. |
| Agricultural Land Resource Assessment of Coalstoun Lakes | 2000 | This assessment was required to assess the potential for irrigation development to ensure sustainable agricultural development. The assessment identifies significant areas suitable for expanded agricultural production. Broadacre cropping is the dominant agricultural production in Coalstoun Lakes. |
| Soils and Agricultural Suitability of the South Burnett Agricultural Lands | 2001 | Report on South Burnett Agricultural Survey, which measured cropping suitability (53% suitable for dryland cropping; 73% for dryland sown pastures; 48% for tree and vine crops). 80% of survey area has been cultivated at some stage, with erosion and salinity issues impacting significant portions. |
| Review for Lower Barambah Coalstoun Lakes Irrigation Scheme | 2015 | Desktop review of previous studies in the Lower Barambah/Coalstoun Lakes Irrigation Scheme, and study of the viability of suitable water infrastructure. Report reviews the SKM (1996) study and PPK (1998) study. |
| Water Proofing Wide Bay Burnett | 2017 | This proposal recommends significant infrastructure investment to increase storage capacity, create more efficient water transfers with new pipeline distribution and restructure the water pricing mechanisms. |
| WBBROC Regional Water Strategy Water Synopsis | 2017 | This synopsis provides a reference for publicly available sources on WBB water security discussions. The synopsis reviews the current position of water security and reliability in WBB and identifies the costs and lost opportunity of the current underutilization of water reserves in the region. |
| Regional Water Position Paper | 2018 | High-level detailed reference information on the operation of water demand, the market and role of water in the WBB economy. |
| Great Ideas…Just Add Water | 2018 | Reports on the meeting of South Burnett water users and the ideas put forward by meeting attendees. References the importance of the feasibility study for the region. Ideas include TPS taking some supply from Wivenhoe Dam, water storage upstream of Barambah Station; Barlil Weir. |
| Water for Economic Development DSDMIP | 2018 | Overview of availability and demand for water in WBB for urban, industrial and agricultural sectors. |
| Queensland Bulk Water Opportunities Statement | 2018 | This is the bulk water security strategy and direction statement for Queensland. This strategic infrastructure document provides a framework through which the Queensland Government can support and contribute to sustainable regional economic development through better use of existing bulk water infrastructure, and planning and investment in new infrastructure. |
| Water Transfer and Hydro Storage Study | 2018 | Study proposes a project for the utilisation of surplus water and electrical power generation. |
| Getting Water for Peanuts | 2018 | Water transfer project with pipeline and pump infrastructure to better utilise allocation to service existing and new irrigation areas. |

| Report title | Date | Description |
|---|---|---|
| Barambah Creek Proposal | 2018 | Informal proposal for the development of a demand distribution system for Barambah Creek and Coalstoun Lakes. The proponent is confident in high and reliable take up of water allocations. |
| Gayndah Regional Irrigation Development (GRID) Project – Detailed Business Case | 2018 | Infrastructure works and water transfer from upstream on the Burnett River to make 24,000ML (approx.) available for the development of 5,000ha for sugarcane production and 1,200 for irrigated rotation cropping. |
| Boondooma presentation – Cooranga Weir Modelling | 2018 | Presentation outlining the hydrological implications of the Cooranga Weir |
| North Burnett Advocacy Action Plan | 2019 | Confirms support for federal funding of the feasibility study to assess options for new water infrastructure in the North and South Burnett Regions. |
| Kingaroy RWSSA Hydrological Assessment – Water Supply Planning | 2019 | The demands for Kingaroy are modelled with the assumption that water will be diverted from both Gordonbrook and Boondooma Dams. Water restrictions are modelled and demonstrate that to achieve modelled reductions that drastic management measures would be required. Multiple scenarios are considered to model the water impact of water restrictions. Findings that an additional 1,300 ML/a would dramatically reduce fail frequency of water supplies. |
| Irrigation from the Boyne River | 2019 | The study assesses the broad social and economic benefits of increased water availability in BRIA in the context of the proposed Cooranga Weir. The study determined that increasing irrigation water reliability from the current 73% to a future 88% would have a major economic impact on BRIA and the whole North Burnett Regional Council area. |

## 2.3 Stakeholder engagement

Stakeholder engagement is critical to the development of a robust strategic business case. As part of this strategic business case, over 35 different stakeholder entities (individuals and groups) were consulted.

The project team conducted multiple field trips to the region (November-December 2019 and February 2020) talking to key stakeholders and visiting farms and potential infrastructure sites. This includes visits to Munduberra, Gayndah, Nanango, Kingaroy, Tarong Power Station, Coalstoun Lakes and the Boyne and Barker Barambah schemes.

Key comments and findings from these engagements informing the service need included:

- Many agricultural stakeholders discussed the low reliability issues within the Boyne and Barker Barambah schemes. Many irrigators have been cut off for over 9 months now. Water available at the start of the year is more valuable to irrigators in the region than water available at the end of the year.
- Farmers in the Coalstoun Lakes area expressed a desire for more water to further expand and develop high value enterprises which requires a greater level of water security. Water for Coalstoun Lakes could come from Paradise Dam or the Barker Barambah scheme (or Wivenhoe).
- The region is well placed to take advantage of rising agricultural demand overseas. It is within a few hours' drive from major Ports and Airports. It also has great opportunities with the rising population of South East Queensland with distance to market being no issue.
- The Tarong Power Station operates within the South Burnett Region and is a significant employer and user of water. They currently source High Priority water from Boondooma Dam (29,270 ML allocation). They also have access to the Wivenhoe to Tarong Pipeline which sources water from Wivenhoe Dam. Water security is critical to Tarong Power Station and its ability to meet power generation requirements. Stanwell have indicated that under normal conditions its preference is to maintain Boondooma Dam as its primary water source to minimise the cost of power generation at the station. There is an estimated 17 years left of operation at this site.
- South Burnett Regional Council is most worried about urban water security for Wondai, Murgon and the supply for Proston, Kingaroy and Blackbutt is also very stretched. Kingaroy has Gordonbrook dam to fall back on when the pipeline is offline. However, once Gordonbrook falls below 50% storage capacity it

becomes almost unusable due to containments in the water. Swickers (Industrial processing) sources its water from council. It is waiting for additional water availability before expanding its operation in the region.

- There is approximately 8,360 ML of dead storage (water below the pipeline) in Boondooma Dam and many stakeholders are unsure who is entitled to that in emergency situations.
- Many stakeholders are interested to see what happens with Paradise Dam. This may present an opportunity for the region to support growth with the potential water that could become available.

Further face to face discussions are proposed with key industry stakeholders in the region.

Details of the stakeholder identification and engagement process can be found in section 6 with a full stakeholder engagement plan provided in Appendix D.

## 2.4 Service need confirmation - Investment Logic Mapping

Investment Logic Mapping (ILM) was adopted to develop a shared understanding and agreement on the:

- problems
- benefits sought
- strategic responses and potential initiatives to address the problems.

Two ILM workshops were held with relevant stakeholders and experts. The data and information presented in the sections above was provided to workshop participants to ensure informed discussions and decisions. The first ILM workshop produced a number of evidence-based statements that clearly articulate the problems underpinning the service need.

Following completion of the second workshop, two outputs were produced - an Investment Logic Map and an Initiatives Map - which articulates the problem (service need), benefits sought and potential initiatives to address the need. The Investment Logic Map is presented below.

Figure 2.42: Investment Logic Map - North Burnett

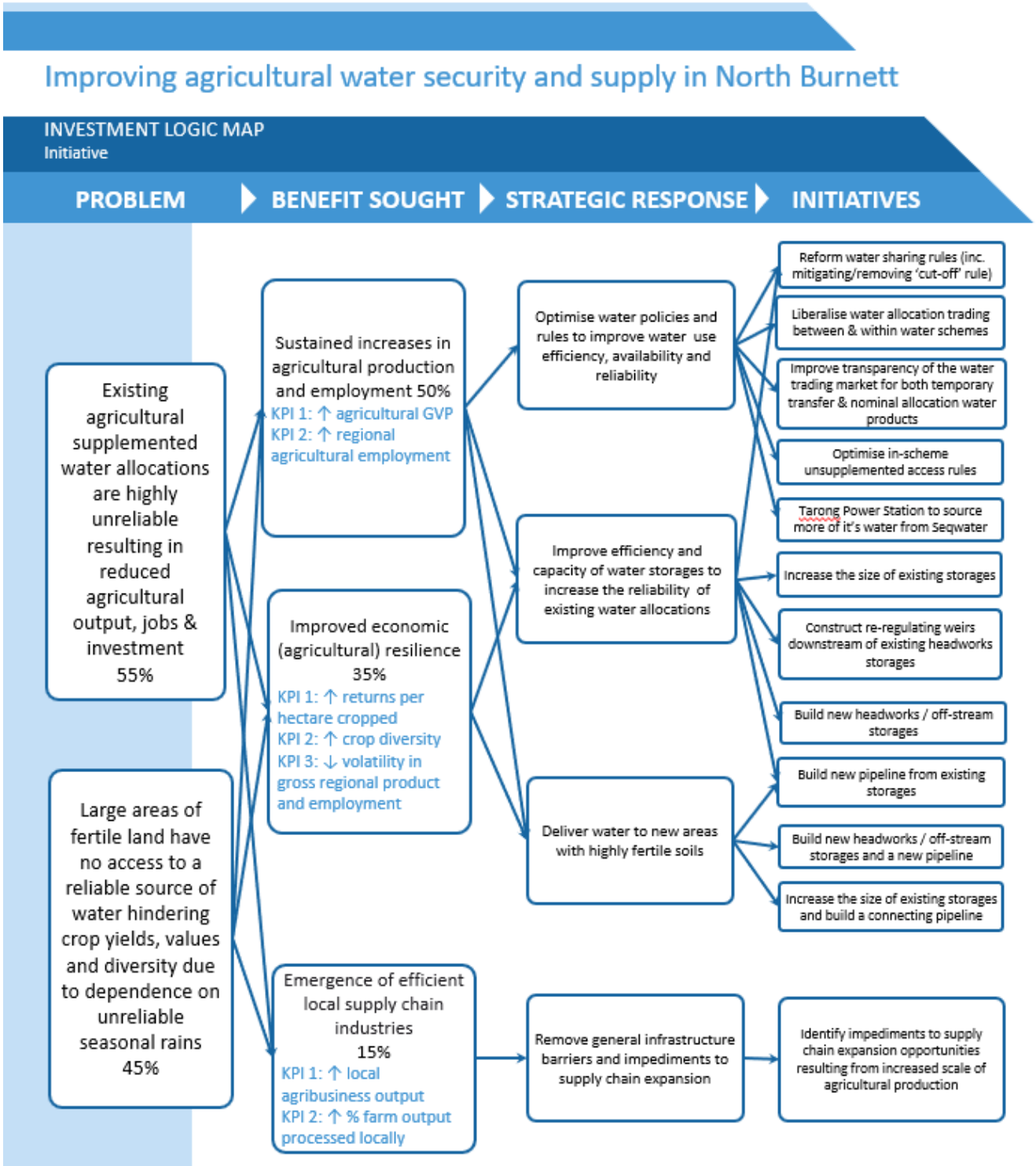
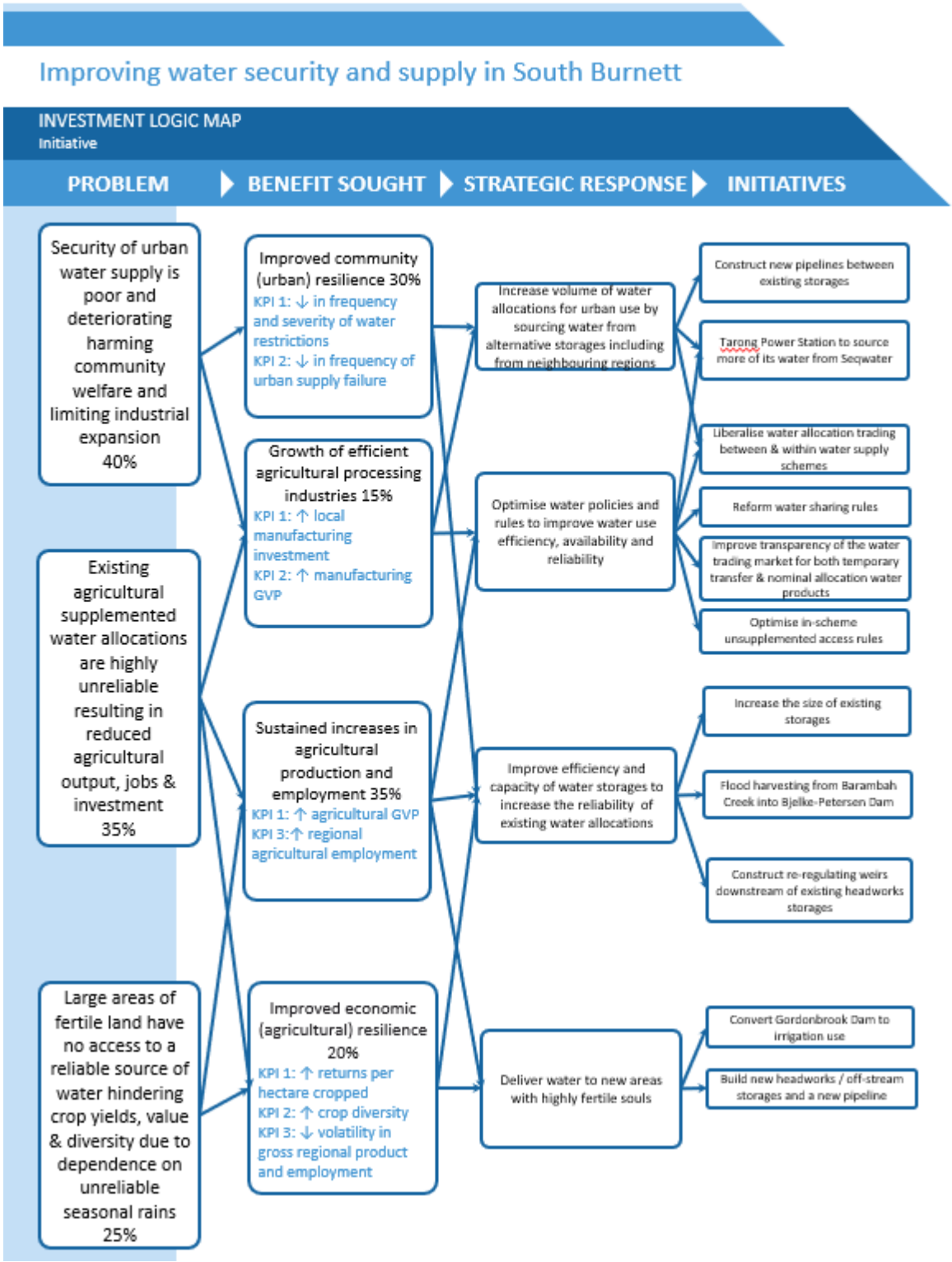


Figure 2.43: Investment Logic Mapping - South Burnett



Additional information underpinning the problem statements are provided below including details of the root cause/s of the problems and supporting evidence.

Table 2-15 Statement of Service Need: Problem 1

| **Problem 1: Security of urban water supply is poor and deteriorating harming community welfare and limiting industrial expansion.** | |
|---|---|
| **Region** | South Burnett only |
| **Description** | Kingaroy has a low level of urban water reliability and an increasing demand for water. Without increasing supply, there is a one in four probability that urban water needs cannot be met in any given year. |
| **Root cause** | ▪ High urban demand growth particularly from industrial users<br>▪ Reliability of Gordonbrook Dam is poor - exacerbated by poor water quality when levels are low<br>▪ Insufficient HP allocation from Boondooma held by Council<br>▪ Limited number of raw water source options<br>▪ Climate change |
| **Evidence** | ▪ Frequency of water restrictions<br>▪ DNRME modelling |

Table 2-16 Statement of Service Need: Problem 2

| **Problem Statement 2: Existing agricultural supplemented water allocations are highly unreliable resulting in reduced agricultural output, jobs & investment** | |
|---|---|
| **Region** | North and South Burnett |
| **Description** | The agricultural sector needs a more reliable water source in order to grow. |
| **Root cause** | ▪ Too much water allocated relative to storage capacity, limited by hydrology<br>▪ Perceived risk averse rules protecting water supply for power generation<br>▪ Inefficient sharing rules that do not incentivise forward planning (e.g. system of announced allocations rather than 'continuous sharing' limits flexibility and choice in allowing water users to select their desired long-term reliability)<br>▪ High transmission losses (beyond that originally envisaged) given the distance from dam walls to the first irrigator<br>▪ Sub-optimal historical planning and infrastructure investment decisions (optimistic hydrology performance assumptions)<br>▪ Climate change<br>▪ Some agricultural crops currently being grown are not suitable given known water reliability |
| **Evidence** | ▪ Supplemented schemes are unreliable and can go several years without supplying irrigation water<br>▪ Agricultural output has not grown in twenty years<br>▪ Unemployment is high / unemployed people leave the area |

Table 2-17 Statement of Service Need: Problem 3

| **Problem Statement 3: Large areas of fertile land have no access to a reliable source of water hindering crop yields, value and diversity due to dependence on unreliable seasonal rains** | |
|---|---|
| **Region** | North and South Burnett |
| **Description** | Large areas of fertile land have no access to a reliable source of supplemented water hindering crop yields, values and diversity due to dependence on unreliable seasonal rains |
| **Root cause** | ▪ The infrastructure has not yet been constructed<br>▪ Topography constraints |
| **Evidence** | ▪ The Burnett region has good quality soil. 14,000 hectares of class 1 soil have been identified from studies of specific areas (surrounding Kingaroy, Gayndah to Munduberra and Coalstoun Lakes).<br>▪ The North Burnett has 195,406 hectares of class 2 and 152,900 hectares of class 3 soil. The good quality soil is clustered around Coalstoun Lakes, Boyne / Mundubbera and St John Creek. The South Burnett has 245,819 hectares of class 2 and 87,971 hectares of class 3 soil. There is a long stretch of class 2 soil that runs along the West of Barker and Barambah creeks.<br>▪ Across the region, approximately 14,000-36,000 hectares are currently used for irrigation, leaving over 600,000 hectares of class 2 and 3 soil available for irrigation. |

# 3. Benefits Sought

## 3.1 Benefits Sought

This section describes the benefits sought from removing or mitigation the defined problems underpinning the service need. During the ILM workshop and in subsequent feedback processes, project stakeholders considered the relative importance of the problems underpinning the service need. Based on the identified importance of problems and the linkages between problems identified and benefits, rankings and weightings of benefits were generated and agreed.

Table 3.1: Benefit sought ranking and weightings

| Rank | North Burnett | South Burnett |
|---|---|---|
| 1 | Sustained increases in agricultural production and employment (50%) | Sustained increases in agricultural production and employment (35%) |
| 2 | Improved economic (agricultural) resilience (35%) | Improved community (urban) resilience (30%) |
| 3 | Emergence of efficient local supply chain industries (15%) | Improved economic (agricultural) resilience (20%) |
| 4 | | Growth of efficient agricultural processing industries (15%) |

Benefits sought were identified and agreed by participants in Investment Logic Mapping workshops (refer Figure 2.42 and Figure 2.43) and are described in further detail in the tables below.

Table 3.2: Benefit sought: Sustained increases in agricultural production and employment

| **Benefit: Sustained increases in agricultural production and employment** | |
|---|---|
| **Relevant sub-region** | **North Burnett**<br>**South Burnett** |
| **Benefit and KPI description** | If water volume and reliability is improved, agricultural production will increase given the amount and suitability of agricultural land in the region.<br>KPIs for this benefit are:<br>• regional gross value of agricultural production (GVP) in dollars (ABS, Value of Agricultural Commodities Produced, SA2, cat. 7503.0)<br>• agricultural employment (ABS census data, Industry of Employment, SA2). Other employment measures may need to be identified to supplement ABS data to ensure seasonal and casual/part-time labour is captured. |
| **Related problem statement** | The benefit sought will be realised through removing or mitigating the following problems<br>• Existing agricultural supplemented water allocations are highly unreliable resulting in reduced agricultural output, jobs & investment (North Burnett)<br>• Existing Barker Barambah agricultural water allocations are highly unreliable resulting in business failures, job losses and reduced investment (South Burnett)<br>• Large areas of fertile land have no access to a reliable source of water hindering crop yields, values and diversity due to dependence on unreliable seasonal rains (North Burnett)<br>• Large areas of fertile land have no or insufficient access irrigation water hindering crop yields, value & diversity due to dependence on seasonal rains (South Burnett)<br>• Security of urban water supply is poor and deteriorating harming community welfare, limiting industrial expansion and contributing to unreliability of agricultural water supply (South Burnett) |
| **Risks** | Biosecurity threats, climate change, poor access to export markets, lack of demand (export or local), future government policy and investment decisions (particularly future Paradise Dam solution) – refer Risk Register (proposal risks) – Appendix C. |

| Benefit: Sustained increases in agricultural production and employment | |
|---|---|
| **Anticipated beneficiaries** | The beneficiaries include – (i) existing and prospective local farm owners, (ii) existing and prospective local farm workers, (iii), agricultural suppliers, transport, logistics, processing and packaging businesses, (ii) and consumers. |
| **Identified dependencies** | The key dependency is irrigators responding to any intervention to address the service need, by either (i) changing water use practices, (ii) taking up new water allocations, at commercially-viable rates, to increase agricultural production, (iii) investing in on-farm infrastructure to service new agricultural production, and (iv) changing land use to higher value agriculture<br><br>Achieving this benefit may require investment in other (non-water) supporting public infrastructure. It also requires availability of labour. |
| **Urgency of benefit** | High/Medium (some degree of urgency for existing irrigators due to drought and recent trend of financial distress, business failures and falling agricultural production and employment). |
| **Timing** | Medium – Long Term (benefit realisation will involve a long ramp up period due to dependencies identified above). |

Table 3.3: Benefit Sought: Improved economic (agricultural) resilience

| Benefit: Improved economic (agricultural) resilience | |
|---|---|
| **Relevant sub-region** | **North Burnett**<br>**South Burnett** |
| **Benefit and KPI description** | If water supply and reliability is improved, investment certainty, crop diversity and average producer margins will improve as a result. In turn, this will **improve economic resilience as** farms will have a less volatile access to water and be better placed to withstand shocks and the local economy will be less reliant on individual agricultural sub-sectors, farms and crops.<br><br>KPIs for this benefit are:<br>• increased average returns (net margin) per hectare cropped (Agricultural Gross Margin Calculator, www.agmargins.net.au)<br>• reduced volatility (variance) in gross regional product (SA2 region https://economy.id.com.au), SA2 region<br>• reduced variance in total employment (Department of Employment, Skills, Small and Family Business, Small Areal Labour Markets publication, Australian Government) |
| **Related problem statement** | The benefit sought will be realised through removing or mitigating the following problems<br>• Existing agricultural supplemented water allocations are highly unreliable resulting in reduced agricultural output, jobs & investment (North Burnett)<br>• Existing Barker Barambah agricultural water allocations are highly unreliable resulting in business failures, job losses and reduced investment (South Burnett)<br>• Large areas of fertile land have no access to a reliable source of water hindering crop yields, values and diversity due to dependence on unreliable seasonal rains (North Burnett)<br>• Large areas of fertile land have no or insufficient access to irrigation water hindering crop yields, value & diversity due to dependence on seasonal rains (South Burnett) |
| **Risks** | Biosecurity threats, climate change, poor access to export markers, lack of demand (export or local), future government policy and investment decisions (particularly future Paradise Dam solution) – refer Risk Register (proposal risks) – Appendix C |
| **Anticipated beneficiaries** | Existing and prospective local businesses, local workers and local residents. |
| **Identified dependencies** | The key dependency is irrigators responding to any intervention to address the service need, by taking up new water allocations, diversifying and changing land use to higher value agriculture<br><br>Achieving this benefit may require investment in other (non-water) supporting public infrastructure. It also requires availability of labour and availability of finance |
| **Urgency of benefit** | Medium |
| **Timing** | Medium – Long Term (benefit realisation will involve a long ramp up period due to dependencies identified above) |

Table 3.4: Benefit Sought: Improved Community (Urban) Resilience

| **Benefit: Improved Community (Urban) Resilience** | |
|---|---|
| **Relevant sub-region** | **South Burnett** |
| **Benefit and KPI description** | **Improved community (urban) resilience** is sought by addressing poor urban water supply security. KPIs for this benefit are a reduction in the frequency and severity of urban water restrictions and reduced in the frequency of supply failure resulting in carting – both under present and forecast future demand. |
| **Related problem statement** | The benefit sought will be realised through removing or mitigating the following problems: Security of urban water supply is poor and deteriorating harming community welfare, limiting industrial expansion and contributing to unreliability of agricultural water supply |
| **Risks** | Nil |
| **Anticipated beneficiaries** | Current and future local residents |
| **Identified dependencies** | Nil |
| **Urgency of benefit** | High (urban water security is unacceptably poor and deteriorating in Kingaroy and intervention to improve community resilience is critical) |
| **Timing** | Immediate |

Table 3.5: Benefit Sought: Growth of efficient agricultural processing industries

| **Benefit: Growth of efficient agricultural processing industries** | |
|---|---|
| **Relevant sub-region** | **South Burnett** |
| **Benefit and KPI description** | Water is a significant input to production for many local industries. **Growth of efficient agricultural processing industries** is currently being held back by a lack of urban water security.<br>The primary KPI for this benefit is regional gross value of manufacturing production (GVP) in dollars. |
| **Problem statement** | The benefit sought will be realised through removing or mitigating the following problems. Security of urban water supply is poor and deteriorating harming community welfare, limiting industrial expansion and contributing to unreliability of agricultural water supply |
| **Risks** | Nil |
| **Anticipated beneficiaries** | Existing local industry (including Swickers and Bega) and emerging future industrial processors. Local workforce. |
| **Identified dependencies** | Capital availability for expansion<br>Increased agricultural production |
| **Urgency of benefit** | Medium |
| **Timing** | Short to Medium term (Swickers and Bega have communicated desire to expand subject to water availability) |

Table 3.6: Benefit Sought: Emergence of Efficient Local Supply Chain Industries

| **Benefit: Emergence of efficient local supply chain industries** | |
|---|---|
| **Relevant sub-region** | **North Burnett** |
| **Benefit and KPI description** | If sustained increases in agricultural output occurs, economies of scale could facilitate the **emergence of efficient local supply chain industries** (i.e. industries that may package, process, cool, dry, or extract the raw agriculture produce, and turn increase the value of the production before it leaves the local area). The primary KPI is an increase in the number of new agribusinesses (Counts of Australian Businesses by SA2 area, ABS Cat. 8165.0). |
| **Problem statement** | • Large areas of fertile land have no access to a reliable source of water hindering crop yields, values and diversity due to dependence on unreliable seasonal rains (North Burnett)<br>• Existing agricultural supplemented water allocations are highly unreliable resulting in reduced agricultural output, jobs & investment (North Burnett) |
| **Risks** | Nil |
| **Anticipated beneficiaries** | New local businesses and their workers |
| **Identified dependencies** | Availability of capital<br>Increased agricultural production |
| **Urgency of benefit** | Low |
| **Timing** | Long term (dependent on sustained increases in agricultural production) |

# 4. Risk

Risk management is essential to reduce the impact that potential problems could have on the preparation of this strategic business case and project delivery. Potential risks are first identified using various tools, and then assessed. Plans for how to control it are developed

This approach details how risks were identified during the strategic business case development to ensure that risks are effectively considered as part of the service need, benefits and initiatives analysis and to ensure the process for developing the strategic business case maximises its potential outcomes.

## 4.1 Approach

The risk management approach is aligned with the DNRME risk matrix and the relevant Australian Standard AS/NZS ISO 31000:2018 Risk Management—Principles and guidelines.

The activities undertaken to identify and consider risk included:

- desktop analysis that drew on the planning and related project experience of the project team
- stakeholder engagement
- facilitated risk discussions at project steering committee meetings.

The risks that these activities aimed to identify were both the material risks to the development of the strategic business case (process risks) and the risks associated with the delivery of any project recommendations and the realisation of project benefits. Risk mitigation strategies were developed and implemented as needed. These findings are summarised in the risk register (Appendix C).

## 4.2 Identifying process risks

Throughout the strategic business case development, several process risks have been considered and managed. The top three process risks are shown in the table below. The full risk register is included in Appendix C.

Table 4.1: Key process risks

| Risk description | Trigger | Impact | Rating | Control strategy |
|---|---|---|---|---|
| Councils do not support project outcomes | Completion of demand and other assessments resulting in recommendations of fewer or different investments than anticipated by councils. | The SBC or PBC is not approved by the PSC, resulting in rework, delays or loss of project funding. | Medium | Comply with good business case practices through an unbiased assessment. |
| Ineffective, duplicated or conflicting communications | Concurrent, related and overlapping Burnett feasibility (NWIDF), BQ and Sunwater processes and studies.<br>Incomplete or ineffective review of existing literature and studies – or an inability to source previous reports. | Frustrated, disengaged or confused stakeholders, leading to project delays, potential loss of project funding. | High | Consolidate stakeholder lists and outline timelines for stakeholder engagement—to be coordinated with other studies.<br>Streamline engagement activities. |
| Delays to concurrent dependent strategic plans and studies | Paradise Dam study, Sunwater Regional Blueprint, SEQ WSP, and Kingaroy Regional Water Supply Security Assessment decisions and outcomes delayed. | Uncertainty regarding project option viability and performance precludes development of project conclusions and recommendations resulting in project delays and potential loss of project funding. | High | Seek regular briefings on direction and likely outcomes of concurrent planning and studies. |

## 4.3 Identifying proposal risks

Throughout the strategic business case development, several proposal risks have been identified. The consequences of these risks for delivering the benefits and outcomes sought from each potential initiative are explored in Chapter 7 and have informed the ranking of initiatives and the generation of the options long list (Chapter 8).

The top five proposal risks appear in the table below. The full risk register is provided in Appendix C.

Table 4.2: Key proposal risks

| Risk description | Trigger | Impact | Rating | Control strategy |
|---|---|---|---|---|
| Climate change | Severity and recurrence of extreme events that are outside the resilience of the cropping systems and water supply options | Failure of water supplies and agricultural systems. | High | Utilising the IPCC climate projection in considering the viability of options and mitigation strategies |
| Export markets do not grow and/or contract | Geopolitical developments lead to increased protectionism and trade restrictions. | Limited export opportunities resulting in reduced demand, margins and ultimately output. | Medium | |
| Risk that the project analysis overestimates demand | ▪ Poor information or inaccurate assumptions informing the demand assessment<br>▪ Market demand satisfied by increased production and investment in other regions. | Underutilised water allocations and reduced agricultural investment and value-add. | Medium | ▪ Application of best practice forecasting methodology<br>▪ Engagement of an experienced party with an understanding of irrigation to forecast demand<br>▪ Ensuring potential infrastructure investments in other regions inform project demand assessment.<br>▪ Use recent market information on levels of demand and willingness to pay to inform the demand assessment |
| Unexpected outcomes from related and overlapping BQ and Sunwater processes and studies | Water infrastructure investment decisions made prior to decisions regarding the long-term future of Paradise Dam and other related assets and policies | Benefits are not fully realised, due to the selection of a suboptimal project option. | High | ▪ Seek regular briefings on direction and likely outcomes of concurrent planning and studies<br>▪ Ensure business case investment recommendations are conditional on outcomes of related studies. |
| Security of electricity generation at Tarong Power Station | Water allocation decisions in relation to Boondooma Dam fail to consider the importance of water security requirements of Tarong Power Station | Water security for Tarong Power Station is impacted by reducing the water supply flexibility for the station and increasing costs of power generation. | Medium | ▪ Consulting closely with Stanwell in relation to water security requirements for Tarong Power Station<br>▪ Assessing relevant prospective options in the context of water security for electricity generation |

# 5. Stakeholders

Key stakeholders identified for engagement include relevant Government Departments and representatives at all levels, impacted landholders, potential customers and suppliers, environmental and community groups, regional businesses, peak bodies, utility providers and Traditional Owners.

## 5.1 Process

The project requires significant stakeholder engagement in order to achieve its objective of identifying a reference project that best meets the needs of the region. In this examination of the region's supply/demand gap, it is critical to undertake strong stakeholder management, engaging appropriately with the relevant people at the right time.

Stakeholders provide:

- assistance in identification of the problem, the needs of the region and available opportunities
- collaboration in development of a longlist of options to solve the identified problem or opportunity
- a source of primary data and lived experience for market insight, refinement of the service need and determination of demand
- refinement of selection criteria relevant to commercial irrigators, the environment, the community, Sunwater, government and regulators
- support for the solution.

They are essential to the success of the project.

## 5.2 Key project stakeholders

The below table provides a summary of identified stakeholders and their interests in the project.

Table 5.1: Key project stakeholders

| Stakeholder category | Stakeholder | Interest/s |
|---|---|---|
| Internal stakeholders | | |
| **Project partners** | Department of Natural Resources, Mines and Energy | • Administrative proponent for the feasibility study |
| | North and South Burnett Regional Councils | • Recipients of the NWIDF funding |
| | Jacobs | • Lead consultant for feasibility study |
| Australian Government | | |
| **Departmental Ministers** | Minister for Agriculture and Water Resources<br>Minister for the Environment and Energy<br>Minister for Infrastructure and Transport | • Alignment with federal objectives and plans<br>• Infrastructure that is properly planned and timed<br>• Investment decision/approval of any further investigations and any resulting project outcomes<br>• Environmental approvals/ requirements |
| **Elected representatives** | Queensland Senators and Federal Members representing study areas – Maranoa, Flynn and Wide Bay. | • Alignment with federal objectives and plans<br>• Infrastructure that is properly planned and timed<br>• State, regional and local economic, social and environmental impacts |
| **Australian Government departments and authorities** | Department of Infrastructure, Regional Development and Cities | • Administration of the NWIDF |

| | | |
|---|---|---|
| | Department of the Environment and Energy<br>Infrastructure Australia | • Administration of funding for renewable energy projects<br>• Review of business cases<br>• Alignment with federal objectives and plans |
| Queensland Government | | |
| **Premier and Departmental Ministers** | Premier and Minister for Trade<br>Queensland Treasurer<br>Minister for Natural Resources, Mines and Energy<br>Minister for State Development, Manufacturing, Infrastructure and Planning<br>Minister for Agricultural Industry Development and Fisheries<br>Minister for Environment and the Great Barrier Reef | • Investment decision/approval<br>• Alignment with other Queensland Government department objectives and plans<br>• Infrastructure investment that is properly planned and timed |
| **Elected representatives** | State Members for Callide and Nanango | • Alignment with state objectives and plans<br>• Infrastructure that is properly planned and timed<br>• Local economic, social and environmental impacts |
| **Queensland Government departments, authorities and corporations** | Queensland Treasury<br>Department of Natural Resources, Mines and Energy<br>Department of State Development, Manufacturing, Infrastructure and Planning (including the Office of the Coordinator-General)<br>Department of Agriculture and Fisheries<br>Department of Environment and Science<br>Building Queensland<br>Sunwater | • Alignment with other Queensland Government department objectives and plans<br>• Infrastructure investment that is properly planned and timed<br>• Review, input and feedback on the SBC and PBC<br>• Alignment of parallel water studies in the region<br>• Ongoing management and delivery activities – in particular, coordination of overlapping project stakeholder management activities |
| Local government | | |
| **Councils** | North Burnett Regional Council + South Burnett Regional Council | • Feasibility Study proponents<br>• Urban water supply security<br>• Agricultural and industrial water supply security<br>• Job creation in the region<br>• Impact on environment<br>• Advancing the area's status as an attractive place to invest<br>• Infrastructure location and planning<br>• Increasing agricultural and related industry production |
| Community and business | | |
| **Community groups** | TBC | • Local regional advocates for water supply security |
| **Landholders** | TBC2.2. | • Impact on existing water supply and environment<br>• Access to property |

| | | |
|---|---|---|
| **Potential customers** | Parties that could receive water from the project | • Solutions to water supply issues<br>• Access to secure water<br>• Business growth and profitability |
| **Environmental groups** | TBC | • Minimisation and/or mitigation of environmental impacts<br>• Monitoring and reporting activities |
| **Traditional owners/Aboriginal cultural heritage** | TBC | • Any Native Title or cultural implications |
| **Business** | Coalstoun Lakes Development Group<br>Kingaroy Chamber of Commerce and Industry<br>Gayndah Chamber of Commerce<br>Burnett Inland Economic Development Organisation<br>Barker Barambah IAC<br>Boyne River and Tarong IAC<br>Three Moon Creek IAC<br>Upper Burnett IAC | • Removing impediments to business growth and regional economic prosperity<br>• Improved conditions for local residents, industry and other sectors<br>• Advancing growth<br>• Job creation in the region<br>• Power generation and supply |
| | Large agricultural and industrial water users, including Stanwell - TBC | |
| **Industry peak bodies** | TBC | • Improved conditions for industry sectors<br>• Advancing the region's status as an attractive place to invest |
| **Potential suppliers** | TBC | • Scope of proposed initiatives as potential business generation |
| **Media** | TBC | • TBC |

A detailed Stakeholder Engagement Plan (SEP) for this assessment is provided in Appendix D.

## 5.3 Engagement mechanism

The below sets out key activities and stakeholder engagement.

Table 5.2: key activities and stakeholder engagement for project.

| Date | Activity | Stakeholder | Agenda |
|---|---|---|---|
| **31 October 2019** | **Project Kick off** | | |
| **November 2019** | Project Steering Committee Meeting | Project Steering Committee | ▪ Project management plan<br>▪ Stakeholder engagement plan<br>▪ Risk register |
| **Week commencing 25 November 2019** | Burnett Immersion: Meetings with both stakeholder councils and one-on-one discussions with key local stakeholders. | North and South Burnett Regional Councils<br>Other key local stakeholders | ▪ Project inception, objectives and plan<br>▪ Identification of service need and opportunities<br>▪ Identification of further key stakeholders |
| **November / December 2019** | Meeting of all concurrent water project actors | DNRME<br>Jacobs<br>Sunwater<br>Building Queensland | ▪ Stakeholder management process overlap and coordination |

| | | | |
|---|---|---|---|
| ***December 2019*** | *Sunwater and Building Queensland concurrent project stakeholder consultation underway* | *Sunwater*<br>*Building Queensland* | ▪ *Jacobs may attend as observers or have input to agenda for shared learnings* |
| **January / February 2020** | Ongoing one-on-one stakeholder engagement | Key stakeholders including potential customers | ▪ Service need and opportunities<br>▪ Assessment criteria |
| **28 January 2020** | Investment Logic Map workshop (Kingaroy and/or Gayndah) | Project Steering Committee plus invited key local stakeholders | ▪ Investment Logic Map workshop #1 |
| **4 February 2020** | Investment Logic Map workshop (Kingaroy and/or Gayndah) | Project Steering Committee plus invited key local stakeholders | ▪ Investment Logic Map workshop #2<br>▪ |
| **February 2020** | **Draft Strategic Business Case** | | |
| **February 2020** | Project Steering Committee Meeting | Project Steering Committee | ▪ Presentation of Draft Strategic Business Case and feedback |
| ***February / March 2020*** | *BQ Final report on Paradise Dam* | *Building Queensland* | |

## 5.4 Stakeholder engagement register

The Stakeholder Engagement Register (SER) table has been developed to provide a summary of key findings arising from engagement with key stakeholders in the project region. The method of documentation for this project is in accordance with the stakeholder engagement plan and Building Queensland guidelines.

It contains record of all stakeholders, contacts, dates of engagement with comments or summarised key findings.

The stakeholder engagement register is in Appendix D.

# 6. Strategic responses

Strategic responses are high-level interventions that can be implemented in more than one way to deliver some or all of the benefits sought, in order to address the service need.

## 6.1 Identifying strategic responses

Strategic responses usually fall into one or more of the following categories, according to whether they:

- change demand
- improve productivity/efficiency
- change supply
- respond directly to the problem/opportunity
- influence the cause of the problem/opportunity
- address the effects/impacts of the problem.

The strategic responses for this project were developed and documented at several investment logic mapping (ILM) workshops in the North and South Burnett (Figure 2.42: Investment Logic Map - North Burnett  and ) and included a broader range of interventions that seek to either change demand, improve efficiency and/or change supply.

Four strategic responses were identified for North Burnett and South Burnett respectively (Table 6.1: North and South Burnett strategic responses ).

Table 6.1: North and South Burnett strategic responses

| North Burnett | South Burnett |
|---|---|
| 1) Optimise water policies and rules to improve water use efficiency, availability and reliability (both areas) | |
| 2) Increase the reliability of existing agricultural water allocations by improving the efficiency and capacity of water storages (north) | 3) Improve efficiency and capacity of water storages to increase the reliability of urban and agricultural water allocations (south) |
| 4) Deliver water to new areas with highly fertile soils (both areas) | |
| 5) Remove general infrastructure barriers and impediments to supply chain expansion (north) | 6) Increase volume of water allocations for urban use by sourcing water from alternative storages including from neighbouring regions |

### 6.1.1 Optimise water policies and rules to improve water use efficiency, availability and reliability

This strategic response could increase investment certainty and returns through improved water security. It could therefore allow for sustained increases in regional agricultural production and (in South Burnett) support the growth of efficient agricultural processing industries.

There is some evidence that certain water policies and rules are currently limiting the expansion and growth in these industries. Reform of these rules through policy coordination from government agencies will help to unlock these benefits.

| Benefit | Strategic response |
|---|---|
| Sustained increases in agricultural production and employment | Optimise water policies and rules to improve water use efficiency, availability and reliability |
| Growth of efficient agricultural processing industries | |

### 6.1.2 Improve efficiency and capacity of water storages to increase reliability of existing water allocations

It is critical that existing resources are used efficiently. As identified in the service need, the reliability of existing agricultural water allocations in North and South Burnett is deficient and is lower than similar schemes in other parts of Queensland. The reliability of existing medium priority allocations is not sufficient for producers to confidently invest in in high-value agricultural crops. Some of the schemes experience high levels of transmission losses. This scheme efficiency could possibly be improved by increasing available storages or adjusting water sharing rules, significant benefits could be realised.

In South Burnett, this strategic response also targets the poor reliability of urban water allocations.

| Benefit | Strategic response |
|---|---|
| Sustained increases in agricultural production and employment | Improve efficiency and capacity of water storages to increase the reliability of existing water allocations |
| Improved economic (agricultural) resilience | |
| Improved community (urban) resilience | |

### 6.1.3 Deliver water to new areas with highly fertile soils

There is a large area of highly fertile soil within the North Burnett (Coalstoun Lakes) that currently has no access to irrigation water and is not being used for high-value agriculture.

There are also areas of highly fertile soil within the South Burnett that currently has very limited access to water. Producers in these areas have the ability to use these soils to grow high value crops but are constrained by the current supply and distribution of water allocations.

This strategic response will address the current impediments and align water allocations to these areas. This will unlock significant economic activity and a sustained increase in agricultural production

| Benefit | Strategic response |
|---|---|
| Sustained increases in agricultural production and employment | Deliver water to new areas with highly fertile soils |
| Improved economic (agricultural) resilience | |

### 6.1.4 Remove general infrastructure barriers and impediments to supply chain expansion

The North Burnett is a large primary production area that leads to value-add through each supply chain stage for many other regions. For local supply chain expansion significant capital investment and an increase in the scale of economic activity are required. For example, a cotton gin and/or fruit and nut processing plant, could be constructed to provide local value add.

Even if agricultural production increased as a result of other strategic responses identified, other barriers may prevent the emergence of more efficient local supply chain industries. Such barriers could for example be a lack of capital, road capacity or electricity generation capacity.

| Benefit | Strategic response |
|---|---|
| Emergence of efficient local supply chain industries | Remove general infrastructure barriers and impediments to supply chain expansion |

### 6.1.5 Increase volume of water allocations for urban use by using water from neighbouring regions

The urban water supply in the South Burnett is constrained at present. The current frequency of restrictions and risk of failure is outside the acceptable level of tolerance.

This strategic response aims to increase the volume of allocations by using water from neighbouring regions (either within the Burnett catchment or other water plan areas) and available water in alternative storages. It will

allow for greater urban water security within the region and provide a diverse supply that is not reliant on one main water source.

It will also support growth in agricultural processing and industrial users that receive their supply of water from the South Burnett Regional Council.

| Benefit | Strategic response |
|---|---|
| Improved community (urban) resilience | Increase volume of water allocations for urban use by sourcing water from alternative storages including from neighbouring regions |
| Growth of efficient agricultural processing industries | |

## 6.2 Conclusion

The ILM process undertaken for the project involving key stakeholders and the projects steering committees identified five strategic responses across the North and South Burnett. These strategic responses target all the benefits sought, and, in doing so, address the related service need.

The following chapter analyses and describes the potential initiatives culminating from the strategic responses that will address the service need.

# 7. Potential initiatives

Potential initiatives are specific high-level activities to address the service need. They culminate from strategic responses and business changes. These potential initiatives and activities required to enable them will form the basis of developing the long list of project options.

## 7.1 Criteria for success and relative importance

The purpose of identifying criteria for success and ranking initiatives from the ILM is to discard or redefine initiatives that insufficiently align with benefits sought or success criteria and inform the long list of options.

The following criteria were considered important to successfully achieve the outcomes sought from any investment and determine the relative importance of initiatives:

1) Benefit alignment
2) Disbenefits
3) Benefit delivery risks
4) Impacts of uncertainty
5) Potential for private sector investment.

## 7.2 Initiatives that were identified

Potential initiatives may include activities that improve the use of an asset, change behaviour or focus, improve the capacity of an existing asset, or implement a new asset. These activities are generally referred to as non-asset, asset-lite and asset solutions, respectively. Potential initiatives may not solve the entire problem and may only enable partial realisation of benefits. However, they may delay the need for implementing more expensive solutions and reduce the size of the problem. Potential initiatives were developed through the respective ILM workshops with the steering committee and key stakeholders. The initiatives are shown in the tables below.

Table 7.1: Initiative 1: Reform water sharing rules (including the mitigating/removing 'cut-off' rule)

| **Initiative 1:** Reform water sharing rules (including the mitigating/removing 'cut-off' rule) | |
|---|---|
| **Initiative description** | Reform water sharing rules permitting supply of irrigation water when Boondooma Dam falls below 70,000 ML. |
| **SIP category** | Reform |
| **Alignment to benefits sought** | Sustained increases in agricultural production and employment — high alignment.<br>Improved economic/agricultural resilience — low/medium alignment. |
| **Additional benefits** | Increases the supply and reliability of medium priority water |
| **Disbenefits** | Potential negative impacts on security objectives and performance of water allocations by changing water sharing rules for existing supplemented and un-supplemented entitlement holders. |
| **Beneficiaries** | Medium priority water allocation holders on the Boyne River |
| **Stakeholders affected** | Tarong Power Station; irrigators on the Boyne River; urban and Industrial water users in the South Burnett; DNRME; Sunwater |
| **Risks** | Reforming the water sharing rules may have the effect of worsening the critical periods for high priority users. This could impact the ability to supply water for power generation and urban purposes during critical supply periods and may require Stanwell to source more of its water from Wivenhoe, which may have impacts on SEQ urban water reliability and the cost to Stanwell of securing its water. This also creates a risk in relation to commercial agreements that Stanwell has regarding the ability to provide power generation capacity. |
| **Uncertainties** | There are uncertainties about how changing water sharing rules in Boondooma Dam would impact current supply for power generation and urban use during critical supply periods. |
| **Potential for private sector involvement** | Low |

Table 7.2: Initiative 2: Liberalise water allocation trading between and within water supply schemes

| **Initiative 2:** Liberalise water allocation trading | |
|---|---|
| **Initiative description** | Enable trading of water allocations (permanent or seasonal assignment) between and within water supply schemes. This might enable water allocations to be moved from a poorly performing scheme or sub-scheme (and thereby improve the performance of its remaining water allocations) to the location of new instream infrastructure elsewhere in the basin (where reserves of unallocated water may be insufficient to support the desired volume of new water allocations |
| **SIP category** | Reform |
| **Alignment to benefits sought** | Sustained increases in agricultural production and employment—high alignment<br>Growth of efficient agricultural processing industries—medium alignment |
| **Additional benefits** | Allows water to move to a higher-value use and will result in a more efficient use<br>Improved community (urban) resilience |
| **Disbenefits** | May require changes to water sharing rules for existing supplemented and un-supplemented entitlement holders |
| **Beneficiaries** | Water allocation holders within the North and South Burnett |
| **Stakeholders affected** | Water allocation holders within the North and South Burnett; Sunwater; DNRME, Seqwater |
| **Risks** | This may either require an amendment to the water plan and/or to the Water Act as there is no precedent or head of power for the trading of supplemented water allocations between water supply schemes. Would need to protect against potential adverse impact regarding performance of existing water allocations. There will be physical and hydrologic constraints on the extent to which this could occur or be considered. |
| **Uncertainties** | There are uncertainties with how the water trading market will operate with this reform.<br>There will be a shift in the way producers in the region operate and invest.<br>It is expected greater trading will allow water to be used where it is most valuable, thus increasing the value of production in the region<br>The government can still monitor and respond to this uncertainty if required |
| **Potential for private sector involvement** | Low |

Table 7.3: Initiative 3: Optimise in-scheme unsupplemented access rules

| **Initiative 3:** Optimise in-scheme unsupplemented access rules | |
|---|---|
| **Initiative description** | Optimising in-scheme unsupplemented access rules to cater for greater use of projected water levels (at the downstream end of the reach of river where water harvesting is occurring) when making water harvesting announcements. At present there is anecdotal evidence that water harvesting opportunities are either cut short or do not commence because the triggers are specified too far downstream from the location of the water allocations. Building in the ability to predict whether downstream levels will be triggered (rather than waiting them to be met) will allow water allocations to actually access their entitlements and offer them greater water security to support expansion of irrigated agriculture. |
| **SIP category** | Reform |
| **Alignment to benefits sought** | Sustained increases in agricultural production and employment—high alignment.<br>Growth of efficient agricultural processing industries—medium alignment. |
| **Disbenefits** | Potential negative impacts on security objectives and performance of water allocations. If thresholds are changed there may be substantial impact on other water users |
| **Beneficiaries** | Water harvesters within the North and South Burnett |
| **Stakeholders affected** | Water harvesters within the North and South Burnett, Sunwater and DNRME. |
| **Risks** | Required approvals and cooperation of Seqwater, DNRME or Sunwater |
| **Uncertainties** | The government can still monitor and respond to this uncertainty if required |
| **Potential for private sector involvement** | Low |

Table 7.4: Initiative 4: Increase the size of existing storages

| **Initiative 4:** Increase the size of existing storages | |
|---|---|
| **Initiative description** | Improve the reliability and security of existing storages by increasing the capacity<br>Potential elements for this initiative include:<br>▪ Raising Boondooma Dam<br>▪ raising Jones Weir.<br>▪ re-instating and/or raising Claude Wharton to FSL |
| **SIP category** | Improve existing |
| **Mutual exclusivity** | Initiative not mutually exclusive |
| **Alignment to benefits sought** | Sustained increases in agricultural production and employment—high alignment.<br>Improved economic (agricultural) resilience — medium alignment.<br>Improved community (urban) resilience – medium alignment. |
| **Additional benefits** | Increases the supply and reliability of water in the respective schemes<br>Improves utilisation of existing assets |
| **Disbenefits** | Potential for greater operating costs associated the capital costs to increase the size of existing storages<br>There may be impacts on existing water users. |
| **Beneficiaries** | Irrigators who will source water from these storages; urban and industrial water users, including Tarong Power Station. |
| **Stakeholders affected** | Irrigators who will source water from these storages; urban and industrial water users; Sunwater; DNRME |
| **Risks** | Risk that there is limited additional demand<br>Impacting security of existing entitlements<br>Environmental obligations |
| **Uncertainties** | There are uncertainties around whether increases in storage size will deliver the required yield and security necessary to justify the capital spend. Further creating additional storage volume would need to comply with the requirements of the Water Plan. |
| **Potential for private sector involvement** | Low |

Table 7.5: Initiative 5: Construct re-regulating weirs downstream of existing headworks storages

| **Initiative 5:** Construct re-regulating weirs downstream of existing headworks storages | |
|---|---|
| **Initiative description** | Improve the reliability and security of existing storages by constructing re-regulating weirs downstream of existing headworks storages. Potential solutions for this initiative include:<br>▪ Cooranga Weir (or another Boyne River site)<br>▪ Barlil Weir. |
| **SIP category** | Build new |
| **Mutual exclusivity** | Initiative not mutually exclusive |
| **Alignment to benefits sought** | Sustained increases in agricultural production and employment —high alignment<br>Improved economic (agricultural) resilience—medium alignment<br>Improved community (urban) resilience —medium alignment |
| **Additional benefits** | Increases the supply and reliability of water in the respective schemes<br>Improves utilisation of existing assets |
| **Disbenefits** | Higher operating and capital costs |
| **Beneficiaries** | Irrigators who will source water from these storages; urban and industrial water users |
| **Stakeholders affected** | Irrigators who will source water from these storages; urban and industrial water users; Sunwater, adjoining landholders |

| **Initiative 5:** Construct re-regulating weirs downstream of existing headworks storages | |
|---|---|
| **Risks** | Required approvals and cooperation of Seqwater, DNRME or Sunwater<br>Delays to concurrent dependent strategic plans and studies<br>Risk that there is limited additional demand |
| **Uncertainties** | Uncertainties around whether these new re-regulating weirs will deliver the require yield and security necessary to justify the capital spend<br>Uncertainties around the actual demand (volume)<br>Environmental approvals and engineering design<br>Creating additional storage volume would need to comply with the requirements of the Water Plan. |
| **Potential for private sector involvement** | Medium to high |

Table 7.6: Initiative 6: Build new headworks / off-stream storages

| **Initiative 6:** Build new headworks / off-stream storages | |
|---|---|
| **Initiative description** | Improve the reliability and security of existing storages by constructing off stream storages. Potential solutions for this initiative include Mt Lawless off-stream storage |
| **SIP category** | Build new |
| **Mutual exclusivity** | Initiative not mutually exclusive |
| **Alignment to benefits sought** | Sustained increases in agricultural production and employment —high alignment<br>Improved economic (agricultural) resilience—medium alignment<br>Improved community (urban) resilience —medium alignment |
| **Additional benefits** | Increases the supply and reliability of water in the respective schemes. Including water uses with on farm, off stream infrastructure. |
| **Disbenefits** | Higher operating and capital costs |
| **Beneficiaries** | Irrigators who will source water from these storages; urban and industrial water users |
| **Stakeholders affected** | Irrigators who will source water from these storages; urban and industrial water users; Sunwater |
| **Risks** | Required approvals and cooperation of Seqwater, DNRME or Sunwater<br>Delays to concurrent dependent strategic plans and studies<br>Risk that there is limited additional demand |
| **Uncertainties** | Uncertainties around whether these new re-regulating weirs will deliver the require yield and security necessary to justify the capital spend<br>Uncertainties around the actual demand (volume)<br>Environmental approvals<br>Creating additional storage volume would need to comply with the requirements of the Water Plan. |
| **Potential for private sector involvement** | Medium to high |

Table 7.7: Initiative 7: Build new pipeline from existing storages

| **Initiative 7:** Build new pipeline from existing storages | |
|---|---|
| **Initiative description** | Extend the existing distribution network to allow the delivery of water to new areas for development. This initiative would also support greater security in the network for urban and industrial use. Potential solutions include connecting pipeline from Paradise Dam to:<br>▪ Coalstoun Lakes<br>▪ Boondooma Dam<br>▪ Kingaroy<br>▪ Biggenden. |

| **Initiative 7:** Build new pipeline from existing storages | |
|---|---|
| **SIP category** | Build new |
| **Mutual exclusivity** | Initiative not mutually exclusive |
| **Alignment to benefits sought** | Sustained increases in agricultural production and employment —medium/high alignment<br>Improved economic (agricultural) resilience—high alignment<br>Improved community (urban) resilience —high alignment |
| **Additional benefits** | None identified |
| **Disbenefits** | None identified |
| **Beneficiaries** | Water users who will be able to draw water from pipeline; current water users from the existing storages |
| **Stakeholders affected** | Water users who will be able to draw water from pipeline; current water users from the existing storages; Sunwater |
| **Risks** | Required approvals and cooperation of Seqwater or Sunwater<br>Delays to concurrent dependent strategic plans and studies<br>Risk that there is limited additional demand<br>Councils do not support project outcomes |
| **Uncertainties** | Initial development cost and on-going costs<br>Actual demand (volume)<br>Environmental approvals and engineering design<br>Future decisions regarding permanent full supply volume of Paradise Dam |
| **Potential for private sector involvement** | Medium to high |

Table 7.8: Initiative 8: Build new headworks / off-stream storages and a new pipeline

| **Initiative 8:** Build new headworks / off-stream storages and a new pipeline | |
|---|---|
| **Initiative description** | Build new off-stream storages and supporting pipeline. This would extend the existing distribution network to allow the delivery of water to new areas for development. This initiative would also support greater security in the network for urban and industrial use. Potential solutions include:<br>▪ connecting Boondooma Dam to Paradise Dam.<br>▪ pipeline from Paradise Dam to Biggenden; Mt Lawless offstream storage (Burnett River) |
| **SIP category** | Build new |
| **Mutual exclusivity** | Initiative not mutually exclusive |
| **Alignment to benefits sought** | Sustained increases in agricultural production and employment —medium/high alignment<br>Improved economic (agricultural) resilience—medium/high alignment<br>Improved community (urban) resilience —high alignment |
| **Additional benefits** | Increases the supply and reliability of water in the respective schemes (new storage). |
| **Disbenefits** | ▪ Higher Operating and Capital costs |
| **Beneficiaries** | Water users who will be able to draw water from pipeline |
| **Stakeholders affected** | Water users who will be able to draw water from the pipeline; Sunwater; the council |
| **Risks** | Required approvals and cooperation of Seqwater, DNRME or Sunwater<br>Delays to concurrent dependent strategic plans and studies<br>Risk that there is limited additional demand<br>Councils do not support project outcomes |
| **Uncertainties** | Initial development cost and on-going costs<br>Actual demand (volume)<br>Environmental approvals and engineering design<br>Future decisions regarding permanent full supply volume of Paradise Dam |

| **Initiative 8:** Build new headworks / off-stream storages and a new pipeline | |
|---|---|
| **Potential for private sector involvement** | Medium to high |

Table 7.9: Initiative 9: Increase the size of existing storages and build a connecting pipeline

| **Initiative 9:** Increase the size of existing storages and build a connecting pipeline | |
|---|---|
| **Initiative description** | Increase the size and capacity of existing storages and build a connecting pipeline. This would extend the existing distribution network to allow the delivery of water to new areas for development. This initiative would also support greater security in the network for urban and industrial use. Potential solutions include:<br>▪ raising Claude Wharton and Jones Weir<br>▪ connecting Boondooma Dam to Paradise Dam<br>▪ pipeline from Paradise Dam to Biggenden<br>▪ Mt Lawless offstream storage (Burnett River) |
| **SIP category** | Build new and improve existing |
| **Mutual exclusivity** | Initiative not mutually exclusive |
| **Alignment to benefits sought** | Sustained increases in agricultural production and employment —medium/high alignment<br>Improved economic (agricultural) resilience— medium/high alignment<br>Improved community (urban) resilience —high alignment |
| **Additional benefits** | Increases the supply and reliability of water in the current respective schemes<br>Allows for increased agricultural production, value and economic activity<br>Increased security for urban and industrial users |
| **Disbenefits** | Potential for greater operating costs associated the capital costs to increase the size of existing storages. |
| **Beneficiaries** | Water users who will be able to draw water from pipeline and current water users from the existing storages |
| **Stakeholders affected** | Water users who will be able to draw water from pipeline; Current water users from the existing storages; Sunwater; the council |
| **Risks** | Required approvals and cooperation of Seqwater, DNRME or Sunwater<br>Delays to concurrent dependent strategic plans and studies<br>Risk that there is limited additional demand<br>Councils do not support project outcomes<br>Creating additional storage volume would need to comply with the requirements of the Water Plan. |
| **Uncertainties** | Initial development cost and on-going costs<br>Actual demand (volume)<br>Environmental approvals and engineering design<br>Future decisions regarding permanent full supply volume of Paradise Dam |
| **Potential for private sector involvement** | Medium to high |

Table 7.10: Initiative 10: Identify impediments to supply chain expansion opportunities resulting from increased scale of agricultural production

| **Initiative 10:** Identify impediments to supply chain expansion opportunities resulting from increased scale of agricultural production | |
|---|---|
| **Initiative description** | The North Burnett is a large primary production area, which leads to value-add through each supply chain stage for many other regions. By identifying and removing impediments greater investment in associated local supply chain industries can occur.<br>This additional growth may allow for even further development and expansion into new markets and areas. |

| **Initiative 10:** Identify impediments to supply chain expansion opportunities resulting from increased scale of agricultural production | |
|---|---|
| **SIP category** | Reform |
| **Mutual exclusivity** | Initiative not mutually exclusive |
| **Alignment to benefits sought** | Emergence of efficient local supply chain industries—high alignment |
| **Additional benefits** | Greater investment in associated local supply chain industries<br>Expansion into new markets and areas and growth in existing production<br>Reduced time and cost for local industry to move products |
| **Disbenefits** | None identified |
| **Beneficiaries** | Local businesses involved in the supply value chain |
| **Stakeholders affected** | The council; Chamber of Commerce; local producers; businesses involved in the supply value chain |
| **Risks** | Export markets<br>Councils do not support project outcomes<br>Risk that there is limited additional demand |
| **Uncertainties** | Cost (required investment amount necessary to support expansion) |
| **Potential for private sector involvement** | Medium to high |

Table 7.11: Initiative 11: Tarong Power Station sourcing more of its water from Seqwater

| **Initiative 11:** Tarong Power Station to source more of its water from Seqwater | |
|---|---|
| **Initiative description** | Tarong Power Station currently has two main sources of water for its operation and water security: Wivenhoe Dam and Boondooma Dam. The primary source is from Boondooma Dam, which is lower cost, and supplementary water is sourced from Wivenhoe Dam. During drought conditions Tarong Power Station often takes higher volumes from Wivenhoe Dam to preserve storage levels at Boondooma Dam (Stanwell have confirmed that in 2019-20 around 50% will be sourced from Wivenhoe Dam).<br>If Tarong Power Station was to utilise the water from Wivenhoe Dam more, there would be less usage of the Stanwell allocation held in Boondooma Dam, thus freeing up this water for other users in the region. This option would require that Tarong Power Station is able to maintain its water security and cost position.<br>The Luggage Point treatment plant provides purified recycled water to the Western Corridor Recycled Water pipeline. It is designed to supply water for urban use when dam levels drop below certain triggers. When not needed for urban use, it may be possible for the recycled water to be supplied to the Burnett region through the Wivenhoe to Tarong pipeline, subject to operational, environmental and other considerations. |
| **SIP category** | Reform; better use |
| **Mutual exclusivity** | Initiative not mutually exclusive |
| **Alignment to benefits sought** | Sustained increases in agricultural production and employment —medium/high alignment<br>Improved economic (agricultural) resilience—medium alignment<br>Improved community (urban) resilience —high alignment |
| **Additional benefits** | Allows for increased agricultural production, value and economic activity<br>Frees up water in Boondooma for greater urban, agricultural and industrial use<br>Will help increase the level of supply and the reliability of water in Boondooma Dam |
| **Disbenefits** | Could impact the ability to supply water for power generation and during critical supply periods.<br>Greater operating costs associated with water from Wivenhoe to Tarong pipeline thereby potentially placing upward pressure on wholesale electricity prices. |
| **Beneficiaries** | Irrigators in the North Burnett; those who source water from Boondooma Dam; urban water users in the South Burnett; industrial water users in the South Burnett |
| **Stakeholders affected** | Stanwell Corporation (Tarong Power Station); irrigators who source water from Boondooma Dam; irrigators who source water from the Wivenhoe to Tarong pipeline; urban water users in the South Burnett; industrial water users in the South Burnett; Seqwater; Sunwater |
| **Uncertainties** | There are uncertainties around how these changes will affect the water sharing and current allocations held |
| **Risks** | This could impact the ability to supply water for power generation and urban purposes during critical supply periods and may require Stanwell to source more of its water from Wivenhoe, which may have impacts on SEQ urban water reliability and the cost to Stanwell of securing its water. This also creates a risk in relation to commercial agreements that Stanwell has regarding the ability to provide power generation capacity. |
| **Potential for private sector involvement** | Low |

Table 7.12: Initiative 12: Convert Gordonbrook Dam to irrigation use

| **Initiative 12:** Convert Gordonbrook Dam to irrigation use | |
|---|---|
| **Initiative description** | Gordonbrook Dam is a South Burnett Regional Council-owned asset used primarily for urban water supply. It also provides a contingent supply when other storages/pipelines go offline. When not needed for urban supply, it could be provided to irrigators for use. |
| **SIP category** | Better use |
| **Mutual exclusivity** | Initiative not mutually exclusive |
| **Alignment to benefits sought** | Sustained increases to agricultural production and employment —high alignment<br>Improved economic (agricultural) resilience —medium alignment |
| **Additional benefits** | May allow for an increase is production for industrial users |
| **Disbenefits** | Could impact the ability to supply water to urban customers during critical supply periods |
| **Beneficiaries** | Irrigators who will be able to draw water for use from Gordonbrook Dam |
| **Stakeholders affected** | Irrigators who will be able to draw water for use from Gordonbrook Dam; urban water users; industrial water users; the council |
| **Risks** | Councils do not support project outcomes<br>Risk that there is limited additional demand |
| **Uncertainties** | Water quality and contamination (water below a certain point in dam may be unusable for irrigation)<br>Ability to supply water to urban customers during critical supply periods |
| **Potential for private sector involvement** | Low to medium |

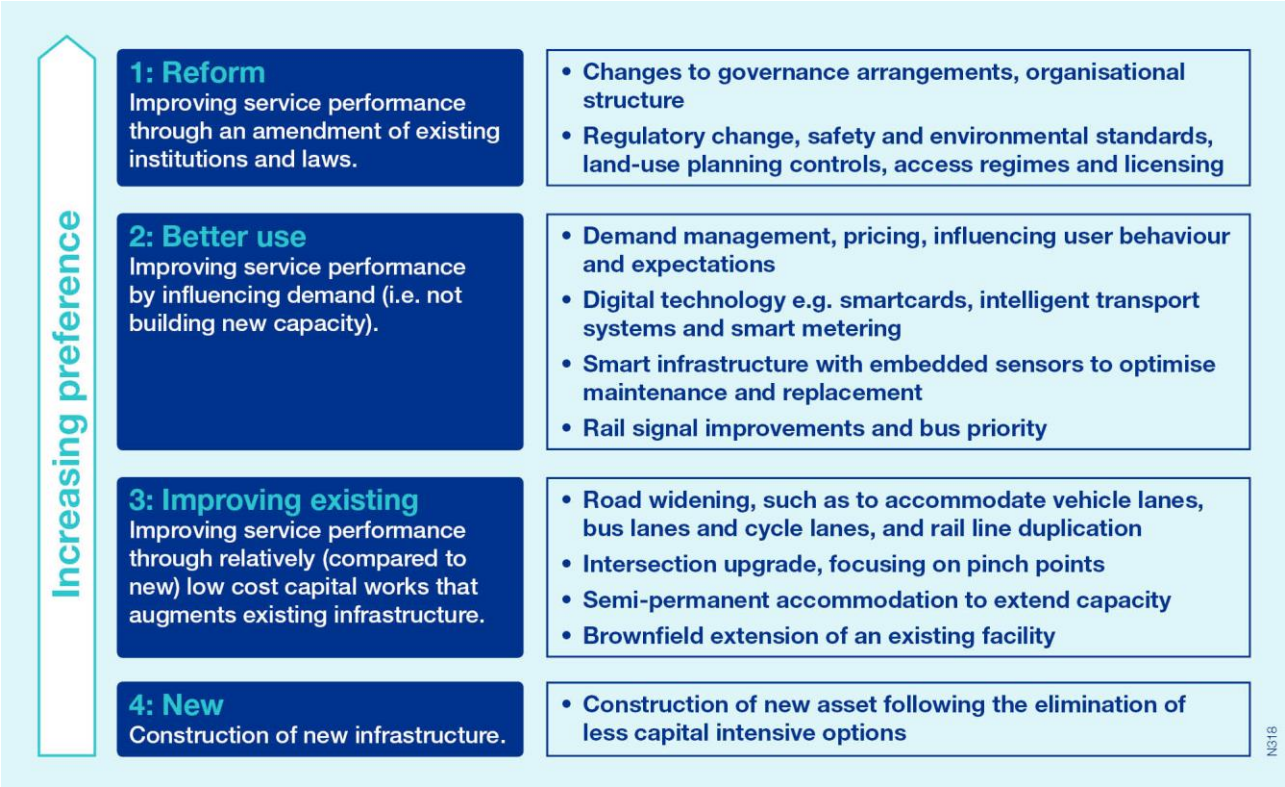
Table 7.13: Initiative 13: Improve transparency of the water trading market for both temporary transfer & nominal allocation water products

| **Initiative 13: Improve transparency of the water trading market for both temporary transfer & nominal allocation water products** | |
|---|---|
| **Initiative description** | Improve the functioning of the water trading markets by improving the quality of the reporting and public information. |
| **SIP category** | Reform |
| **Mutual exclusivity** | Initiative not mutually exclusive |
| **Alignment to benefits sought** | Sustained increases in agricultural production and employment —medium alignment<br>Improved economic (agricultural) resilience—medium alignment |
| **Additional benefits** | May allow for water to be used on its highest value use through an efficient trading market |
| **Disbenefits** | Trading data is already published. |
| **Beneficiaries** | Irrigators |
| **Stakeholders affected** | Irrigators |
| **Risks and uncertainties** | There is limited evidence that the market is not operating efficiently, and intervention may not produce material benefits. |
| **Potential for private sector involvement** | NA |

## 7.3 Alignment to the State Infrastructure Plan

The State Infrastructure Plan ranks initiatives from most preferred (reform) to least preferred (new) (**Figure 7.1**).

Figure 7.1: State Infrastructure Plan Priority Model




*Source: State Infrastructure Plan (2016)*

Each of the potential initiatives has been categorised according to the State Infrastructure Plan. Most of the potential initiatives relate to either 'reform' or 'build new'.

Table 7.14: Alignment with the State Infrastructure Plan

| Reform | Better use | Improve existing | New |
|---|---|---|---|
| Reform water sharing rules (including mitigating/removing 'cut-off' rule | Flood harvesting from Barambah Creek into Bjelke-Petersen Dam | Increase size of existing storages | Construct re-regulating weirs downstream of existing headworks storages |
| Liberalise water allocation trading between and within water supply schemes | Convert Gordonbrook Dam to irrigation use | Increase the size of existing storages and build a connecting pipeline | Build new headworks / off-stream storages |
| Optimise in-scheme unsupplemented access rules | | – | Build new pipeline from existing storages |
| Identify impediments to supply chain expansion opportunities resulting from increased scale of agricultural production | | – | Build new headworks / off-stream storages and a new pipeline |
| Tarong Power Station to source more of its water from Seqwater – | | – | Increase the size of existing storages and build a connecting pipeline |

# 8. Options generation

A number of options have been identified that address the service need, consistent with the potential initiatives. The options have been developed through a combination of review of past reports (Appendix A), stakeholder consultation and our professional judgement.

To be included on the long-list, there needs to be a realistic prospect that the option can address the service need and deliver some of the benefits sought.

It is expected that the assessment process undertaken in the preliminary business case will identify further sub-options and option combinations.

The long list is presented below and then each option is described further below. The order does not imply any ranking.

Table 8.1: Options long list

| Option number | Option name |
|---|---|
| 1 | Remove the 70,000 ML cut-off rule in Boondooma dam |
| 2 | Inter-changeable water allocations between schemes |
| 3 | Optimise in-scheme unsupplemented access rules |
| 4 | Greater utilisation of the Wivenhoe to Tarong pipeline |
| 5 | Raise Boondooma Dam |
| 6 | Raise Claude Wharton Weir |
| 7 | Raise Claude Wharton Weir and build a pipeline to area of urban or irrigation demand |
| 8 | Raise Jones Weir |
| 9 | Raise Jones Weir and build a pipeline to area of urban or irrigation demand |
| 10 | Construct a re-regulating weir on the Boyne River |
| 11 | Construct a re-regulating weir on the Barambah Creek |
| 12 | Water harvesting |
| 13 | Barambah Creek Dam at 39.3 km and irrigation network primarily for Coalstoun Lakes |
| 14 | Barambah Creek Dam at 41.6 km and irrigation network primarily for Coalstoun Lakes |
| 15 | Barambah Creek Dam at 43.0 km and irrigation network primarily for Coalstoun Lakes |
| 16 | Build a pipeline from Paradise Dam to Tarong – Wivenhoe pipeline via Coalstoun Lakes |
| 17 | Build a pipeline from Paradise Dam to Boondooma Dam via Coalstoun Lakes |
| 18 | Up to 100,000 ML dam or weir on Barambah Creek and irrigation network primarily for Coalstoun Lakes |
| 19 | Agricultural supply chain improvements (e.g. local value add / increase processing of peanuts and blueberries) |
| 20 | Tarong Power Station to source more of its water from Wivenhoe Dam |
| 21 | Tarong Power Station to source more of its water from manufactured water products |
| 22 | Flood harvesting from Barambah Creek into Bjelke-Petersen Dam |
| 23 | Convert Gordonbrook Dam to irrigation use |

A description of each options is as follows.

| Option 1 | Remove the 70,000 ML cut-off rule in Boondooma dam |
|---|---|
| Description | The existing water sharing rules prevent medium priority (irrigation) supply once the water stored volume in Boondooma falls below 70,000 ML. This rule was designed to underpin the reliability of high priority water entitlements and was established prior to the construction of the Wivenhoe to Tarong pipeline. Removing the cut-off rule would require reform of the water sharing rules for the Boyne Tarong Scheme perhaps by introducing a bulk continuous share arrangement that underpins the announced allocations. |
| Alignment with potential initiatives | Initiative 1: Reform water sharing rules (including the mitigating/removing 'cut-off' rule) |
| Problems and benefits targeted | This option would improve reliability for medium priority irrigators on the Boyne River. |
| Option category | Reform |
| Stakeholders | Stanwell Corporation (Tarong Power Station); irrigators on the Boyne River; urban and Industrial water users in the South Burnett |
| Adverse impacts and risks | The water sharing rules would need to be crafted to ensure that high priority water allocation holders' water allocation security objective (WASO) is maintained (for urban and Tarong Power Station). The cut-off rule also provides protection against certain unforeseen future events.<br>If water security for Tarong Power Station is impacted, then there is a risk that electricity generation could be materially impacted. This would impact energy security and Stanwell's commercial obligations to act commercially. |
| Timeframe | Medium-term |
| Interaction with other options | Although this option would not necessarily increase the long-term reliability for medium priority water allocations, it would remove the cut-off rule. Other options (such as introduction of downstream reregulating storage would complement this option to increase the long-term reliability for medium priority water allocations. |

| Option 2 | Inter-changeable water allocations between schemes |
|---|---|
| Description | This option may provide a means for water allocations to be moved from an under-performing water supply scheme to a location where new water infrastructure is being contemplated but where unallocated water reserves in the water plan are insufficient to underpin the additional yield at the new location. The reliability of water allocations in the scheme from which the water allocations are moved would also be improved due to there being less volume to supply in that scheme. |
| Alignment with potential initiatives | Initiative 2: Liberalise water allocation trading between and within water supply schemes |
| Problems and benefits targeted | Would provide a means of moving water allocations to where new water infrastructure and demands are located. This option is subject to hydrologic assessment showing that water is physically available to be taken from the proposed locations whilst meeting the environmental flow objectives and water allocation security objectives in the water plan. |
| Option category | Reform |
| Stakeholders | Water allocation holders in all schemes |
| Adverse impacts and risks | This option may either require an amendment to the water plan and/or to the Water Act as there is no precedent or head of power for the trading of supplemented water allocations between water supply schemes. Would need to protect against potential adverse impact regarding performance of existing water allocations. There will be physical and hydrologic constraints on the extent to which this could occur or be considered. |
| Timeframe | Medium to long-term (due to requirement for water plan and/or Water Act amendment) |
| Interaction with other options | Other options involving new infrastructure may interact with this option if unallocated reserves are insufficient. This option interacts with options 20 and 21, as water could be delivered from other areas. |

| Option 3 | Optimise in-scheme unsupplemented access rules |
|---|---|
| Description | This option would involve optimising in-scheme unsupplemented access rules to enable the use of forecast (rather than the current actual) downstream water levels when making water harvesting announcements (in relation to both the commencement and cessation of water harvesting events). This will allow greater utilisation of water harvesting opportunities by existing unsupplemented water allocations and support expansion of irrigated agriculture. |
| Alignment with potential initiatives | Initiative 3: Optimise in-scheme unsupplemented access rules |
| Problems and benefits targeted | At present, there is anecdotal evidence that water harvesting opportunities are either cut short or do not commence because the triggers are specified too far downstream from the location of the water allocations. Building in the ability to predict whether downstream levels will be triggered (rather than waiting them to be met) will allow water allocations to actually access their entitlements and offer them greater water security to support expansion of irrigated agriculture. |
| Option category | Reform |
| Stakeholders | Unsupplemented water allocation holders |
| Adverse impacts and risks | The cost to DNRME of implementing enhanced water allocation announcements may increase due to the need for improved telemetry within the river system coupled with more proactive management of the commencement, cessation and monitoring of water harvesting events.<br>As it is likely that hydrologic models already assume that the volume taken in water harvesting events is maximised, removing operational limitations to enhance actual access is unlikely to impact on water planning objectives. |
| Timeframe | Short-term |
| Interaction with other options | Would complement all other options. |

| Option 4 | Greater utilisation of the Wivenhoe to Tarong pipeline |
|---|---|
| Description | There currently is a pipeline from Wivenhoe Dam to the Tarong Power Station. It is primarily used to supply water to the Tarong Power Station (used in conjunction with Boondooma Dam), and was constructed to provide water security for the station. If this pipeline could be greater utilised, there would be less requirement for existing water allocations to be held in Boondooma Dam, thus freeing up water for other users – such as urban and industrial users. The option could potentially, wholly or partially, address the urban water security concerns in some or all of the towns in South Burnett.<br>Alternatively, users along the pipeline route could be supplied with additional water for high value agriculture. |
| Alignment with potential initiatives | Initiative 4: Greater utilisation of the Wivenhoe to Tarong pipeline to free up water in Boondooma Dam |
| Problems and benefits targeted | If more water was available for irrigation use, either along the pipeline, or from Boondooma Dam, then this would support agricultural production and employment. |
| Category | Better use |
| Stakeholders | Seqwater, Tarong Power Station, Irrigators, North and South Burnett councils and industrial users. |
| Adverse impacts and risks | Pumping water from Wivenhoe is more expensive than from Boondooma for Tarong Power Station and this option may increase Stanwell's costs and electricity prices.<br>Using the Tarong Pipeline for alternate uses could impact water security at Tarong Power Station and / or impact on South East Queensland water security unless provisions would put in place to maintain water security levels.<br>Commercial transactions may not be possible between Stanwell and other customers (such as councils, industrial users or irrigators) for the temporary or permanent transfer of allocations. |
| Timeframe | Short-term |
| Interaction with other options | This option interacts with options that impact Boondooma Dam, as a reduction in take from Tarong would allow more water to be available in Boondooma Dam, which could be used for other users. Interaction with Options 1, 2, 5, 20, 21. |

| Option 5 | Raise Boondooma Dam |
|---|---|
| Description | Raise wall by 12 metres (or similar) using fixed crest structure without gates to increase capacity by 396,000 ML, to 600,000 ML. |
| Alignment with potential initiatives | Initiative 5: Increase the size of existing storages |
| Problems and benefits targeted | The benefits would be increased reliability and allocations which could be used by Boyne River irrigators, Tarong Power Station or urban / industrial users. The option could potentially, wholly or partially, address the urban water security concerns in some or all of the towns in South Burnett. |
| Category | New |
| Stakeholders | SunWater, current and future users of Boondooma dam, affected property holders (if applicable), |
| Adverse impacts and risks | A full EIS would likely be required, in addition various state-level regulatory reviews and approvals taking a minimum of 6 years, with 10+ years of environmental monitoring required post construction. Given that Tarong Power Station has a forecast closure in 17 years, its Water Allocation will become available and reduce the need for additional storage.<br>The estimated cost is $110m, including approvals.<br>Significant changes would be required to the Burnett Basin Water Plan to support the creation of unallocated water. Hydrologic capacity of the catchment may not support such a raising and/or this raising may not be hydrologically efficient in this Boyne sub-catchment. Water from Paradise Dam may need to be moved to implement this option – investigation to continue in the Preliminary Business Case to see whether this is possible.<br>Raising of the dam may not produce significant benefits. |
| Timeframe | Long-term |
| Interaction with other options | This option interacts with other options involving Boondooma Dam, including options 1, 2, 5, 20, 21. |

| Option 6 | Raise Claude Wharton Weir |
|---|---|
| Description | 1.5 metre raising of the Claude Wharton Weir Full Supply Level by installing crest gates to replace lost volume from rubber bag deflation. |
| Alignment with potential initiatives | Initiative 5: Increase the size of existing storages |
| Problems and benefits targeted | Sustained increases in agricultural production and employment |
| Category | Improve existing |
| Stakeholders | Irrigators who will source water from these storages; urban and industrial water users; Sunwater |
| Adverse impacts and risks | Risk that there is limited additional demand |
| Water availability | This would enable reinstatement of 10,469ML of medium priority water allocations that are held by Burnett Water but are currently excluded from the scheme's water sharing rules. |
| Timeframe | Medium - term |
| Previous studies | Gayndah Regional Irrigation Development Project (GRID) |

| Option 7 | Raise Claude Wharton Weir and build a pipeline to area of urban or irrigation demand |
|---|---|
| Description | 1.5 metre raising of the Claude Wharton Weir Full Supply Level by installing crest gates to replace lost volume from rubber bag deflation.<br>This water could then be transported through a pipeline to areas where soil suitability is high, possible to the high-quality soil along the South side of the Burnett River, or to Coalstoun Lakes. A pipeline reduces transmission losses and allows water to be delivered to suitable areas that are not adjacent to a river. |
| Alignment with potential initiatives | Initiative 10: Increase the size of existing storages and build a connecting pipeline |

| Option 7 | Raise Claude Wharton Weir and build a pipeline to area of urban or irrigation demand |
|---|---|
| Problems and benefits targeted | Sustained increases in agricultural production and employment |
| Category | New |
| Stakeholders | Existing and future irrigators, North Burnett Regional Council, SunWater |
| Adverse impacts and risks | Risk that there is limited additional demand and a pipeline may not be cost effective relative to river transmission. |
| Timeframe | Medium - term |
| Water availability | This would enable reinstatement of 10,469ML of medium priority water allocations that are held by Burnett Water but are currently excluded from the scheme's water sharing rules. |
| Previous studies | Gayndah Regional Irrigation Development Project (GRID) |

| Option 8 | Raise Jones Weir |
|---|---|
| Description | Jones Weir is one of the oldest concrete weirs commissioned in Queensland and was constructed in 1951 on the Burnett River just outside Mundubbera. The weir could be raised by 1.4 m to double to volume of stored water. The land has been acquired and some design work done by Burnett water. |
| Alignment with potential initiatives | Initiative 5: Increase the size of existing storages |
| Problems and benefits targeted | Sustained increases in agricultural production and employment |
| Category | Improve existing |
| Stakeholders | Existing and future irrigators, North Burnett Regional Council, SunWater |
| Adverse impacts and risks | An EIS may be required |
| Water availability | Water from Paradise Dam may need to be moved to implement this option – investigation to continue in the Preliminary Business Case. |
| Timeframe | Medium |

| Option 9 | Raise Jones Weir and build a pipeline to area of urban or irrigation demand |
|---|---|
| Description | Jones Weir is one of the oldest concrete weirs commissioned in Queensland and was constructed in 1951 on the Burnett River just outside Mundubbera. The weir could be raised by 1.4 m to double to volume of stored water. The land has been acquired and some design work done by Burnett water.<br>This water could then be transported through a pipeline to areas where soil suitability is high. A pipeline reduces transmission losses and allows water to be delivered to suitable areas that are not adjacent to a river. |
| Alignment with potential initiatives | Initiative 10: Increase the size of existing storages and build a connecting pipeline |
| Problems and benefits targeted | Sustained increases in agricultural production and employment |
| Category | New |
| Stakeholders | Existing and future irrigators, North Burnett Regional Council, SunWater |
| Adverse impacts and risks | An EIS may be required |
| Water availability | Water from Paradise Dam may need to be moved to implement this option – investigation to continue in the Preliminary Business Case. |
| Timeframe | Medium |

| Option 10 | Construct a re-regulating weir on the Boyne River |
|---|---|
| Description | It takes five to ten days for water to reach irrigators on the Boyne River after been released from Boondooma Dam. There are further inflows downstream of the dam that could be captured if there were a re-regulating weir.<br>In 2017, Sunwater modelled the impact on reliability of a weir at 34.45 AMTD and found that MP allocations would have an 11% increase in monthly performance. The weir would cost $25 million and increase current prices by $200/ML/annum. Irrigators did not elect to pursue this option at that price point.<br>Other potential locations to investigate include at 33.8 AMTD and 33.95 AMTD. |
| Alignment with potential initiatives | Initiative 6: Construct re-regulating weirs downstream of existing headworks storages |
| Problems and benefits targeted | Sustained increases in agricultural production and employment |
| Category | New |
| Stakeholders | Adjacent landholders, Boyne River Irrigators, SunWater |
| Adverse impacts and risks | A 1998 study found geotechnical and environmental issues to overcome at the Cooranga site. The funding mechanism is still uncertain. |
| Water availability | This option seeks to increase reliability rather than create additional water allocations. According, it is understood that there is no need to obtain water in the Water Plan. However, this will be investigated and confirmed in the Preliminary Business Case. |
| Timeframe | Medium |

| Option 11 | Construct a re-regulating weir on the Barambah Creek |
|---|---|
| Description | Build a new weir on Barambah Creek to increase water reliability of existing allocations. This will also improve alignment of agricultural water allocations to demand in areas containing fertile soils.<br>Potential solutions include Barlil Weir (135 km upstream of its convergence with the Burnett River and about 8 km north-west of the township of Murgon).<br>The Barlil Weir could have a capacity of 1,000 ML and annual yield of 3,000 ML. The cost has been estimated by Sunwater at approximately $20 million. An EIS is already in place. |
| Alignment with potential initiatives | Initiative 6: Construct re-regulating weirs downstream of existing headworks storages |
| Problems and benefits targeted | Sustained increases in agricultural production and employment |
| Category | New |
| Stakeholders | Irrigators who will source water from these storages; urban and industrial water users; Sunwater; DNRME |
| Adverse impacts and risks | The funding mechanism is still uncertain. |
| Water availability | The water is currently held in the Water Plan. No water would be needed from Paradise Dam. |
| Timeframe | Medium - term |

| Option 12 | Water harvesting |
|---|---|
| Description | This off-stream storage concept is based around harvesting wet—season floodwaters for later use to irrigate riparian and near riparian lands. It could be expected that this type of development would be replicated in multiple locations across lands that have previously been identified noting static lift and distance from watercourse.<br>This option generally has fewer environmental regulations to satisfy as in-stream infrastructure is limited and there is very little additional inundation. |

| Option 12 | Water harvesting |
|---|---|
| Alignment with potential initiatives | Initiative 7: Build new headworks / off-stream storages |
| Problems and benefits targeted | Sustained increases in agricultural production and employment |
| Category | New |
| Stakeholders | Landholders, irrigators, Sunwater |
| Adverse impacts and risks | Suitable sites need to be available adjacent to areas of water demand.<br>Downstream users' existing rights need to be maintained. |
| Timeframe | Medium |

| Option 13 | Barambah Creek Dam at 39.3 km and irrigation network primarily for Coalstoun Lakes |
|---|---|
| Description | The dam site located at 39.3 km is located downstream of the confluence with Boonara Creek upstream of where the valley opens out into broad plains. The site is in a north-westerly reach upstream of a bend toward the North-northwest. A 48 m high dam is needed for 250,000 ML storage with the spillway on the right abutment. The abutments slope at 20-22 degrees in basalt and the riverbed was obscured with water at the time of the geological appraisal.<br>There are some combinations of irrigation networks to deliver this water:<br>a) Coalstoun Lakes, Ban Ban Springs and Biggenden: Irrigation of the Coalstoun Lakes and Ban Ban Springs areas through a pipeline reticulation system pumped from a new storage. Pump station with main pipeline located parallel to Isis Highway. 3km tunnel to Biggenden. Total capacity of 52,100ML/a to irrigate 9,370 hectares for a cost of between $136 million to $279 million ($2015).<br>b) Coalstoun Lakes, Ban Ban Springs: Irrigation of the Coalstoun Lakes, Ban Ban Springs and Biggenden areas through a pipeline reticulation system pumped from a new storage. Pump station with main pipeline located parallel to Isis Highway. Total capacity of 42,690 ML/a to irrigate 8,200 hectares for a cost of between $136 million to $279 million ($2015).<br>c) Coalstoun Lakes/Biggenden Water Development Group Irrigation Area including Biggenden: Irrigation of Coalstoun Lakes, Ban Ban Springs and Biggenden through a pipeline reticulation system pumped from a new storage. Pump station with main pipeline located parallel to Isis Highway. 3km tunnel to Biggenden. Total capacity of 52,100ML/a to irrigate 8,686 hectares for a cost of between $136 million to $279 million ($2015).<br>d) Coalstoun Lakes/Biggenden Water Development Group Irrigation Area excluding Biggenden: Irrigation of Coalstoun Lakes and Ban Ban Springs (not Biggenden) through a pipeline reticulation system pumped from a new storage. Pump station with main pipeline located parallel to Isis Highway. Total capacity of 49,200 ML/a to irrigate 8,200 hectares for a cost of between $115 million to $215 million ($2015). |
| Alignment with potential initiatives | Initiative 9: Build new headworks / off-stream storages and a new pipeline |
| Problems and benefits targeted | Sustained increases in agricultural production and employment |
| Category | New |
| Stakeholders | Potential irrigators |
| Adverse impacts and risks | The total cost is high, and the dam site requires more investigation to ascertain its suitability.<br>Downstream users' existing rights need to be maintained. |
| Water availability | This option would require substantial water from the Water Plan. While there is some unallocated water, it may not be sufficient, and additional water may be needed, potentially from Paradise Dam. However, there is not yet a decision on the future of Paradise Dam. |
| Timeframe | Long-term |
| Previous studies | Review for Lower Barambah Coalstoun Lakes Irrigation Scheme (GHD, 2015) |

| Option 14 | Barambah Creek Dam at 41.6 km and irrigation network primarily for Coalstoun Lakes |
|---|---|
| Description | Site at 41.6 km — this is located downstream of the confluence with Boonara Creek where the creek makes a sharp bend from the northeast to the northwest. The site is in a steep gorge with left bank slopes of greater than 50 degrees and right bank slopes increasing from 12 degrees to 40 degrees about 35 m above the river. The riverbed was obscured but a rock bar was causing the water to drop 1.5 m at the dam axis. The left abutment was noted to have evidence of land sliding and instability.<br>There are some combinations of irrigation networks to deliver this water:<br>a) Coalstoun Lakes, Ban Ban Springs and Biggenden: Irrigation of the Coalstoun Lakes and Ban Ban Springs areas through a pipeline reticulation system pumped from a new storage. Pump station with main pipeline located parallel to Isis Highway. 3km tunnel to Biggenden. Total capacity of 52,100ML/a to irrigate 9,370 hectares for a cost of between $136 million to $279 million ($2015).<br>b) Coalstoun Lakes, Ban Ban Springs: Irrigation of the Coalstoun Lakes, Ban Ban Springs and Biggenden areas through a pipeline reticulation system pumped from a new storage. Pump station with main pipeline located parallel to Isis Highway. Total capacity of 42,690 ML/a to irrigate 8,200 hectares for a cost of between $136 million to $279 million ($2015).<br>c) Coalstoun Lakes/Biggenden Water Development Group Irrigation Area including Biggenden: Irrigation of Coalstoun Lakes, Ban Ban Springs and Biggenden through a pipeline reticulation system pumped from a new storage. Pump station with main pipeline located parallel to Isis Highway. 3km tunnel to Biggenden. Total capacity of 52,100ML/a to irrigate 8,686 hectares for a cost of between $136 million to $279 million ($2015).<br>d) Coalstoun Lakes/Biggenden Water Development Group Irrigation Area excluding Biggenden: Irrigation of Coalstoun Lakes and Ban Ban Springs (not Biggenden) through a pipeline reticulation system pumped from a new storage. Pump station with main pipeline located parallel to Isis Highway. Total capacity of 49,200 ML/a to irrigate 8,200 hectares for a cost of between $115 million to $215 million ($2015). |
| Alignment with potential initiatives | Initiative 9: Build new headworks / off-stream storages and a new pipeline |
| Problems and benefits targeted | Sustained increases in agricultural production and employment |
| Category | New |
| Stakeholders | Potential irrigators |
| Adverse impacts and risks | The total cost is high, and the dam site requires more investigation to ascertain its suitability. The left abutment had evidence of land-sliding |
| Timeframe | Long-term |
| Water availability | This option would require substantial water from the Water Plan. While there is some unallocated water, it may not be sufficient, and additional water may be needed, potentially from Paradise Dam. However, there is not yet a decision on the future of Paradise Dam. |
| Previous studies | Review for Lower Barambah Coalstoun Lakes Irrigation Scheme (GHD, 2015) |

| Option 15 | Barambah Creek Dam at 43.0 km and irrigation network primarily for Coalstoun Lakes |
|---|---|
| Description | Site at 43.0 km — this is located upstream of the confluence with Boonara Creek. A 62 m high dam with storage of 280,000 ML was recommended. The dam site is in a symmetrical valley of 20-degree slopes. Water was ponded over the riverbed obscuring observation of rock. A tributary constrains the downstream end of the left abutment at this site and the saddle of the right abutment presents a good location for a spillway structure.<br>The dam has a capacity of 210,000 ML and a capital cost of $575 million ($2015).<br>There are some combinations of irrigation networks to deliver this water:<br>a) Coalstoun Lakes, Ban Ban Springs and Biggenden: Irrigation of the Coalstoun Lakes and Ban Ban Springs areas through a pipeline reticulation system pumped from a new storage. Pump station with main pipeline located parallel to Isis Highway. 3km tunnel to Biggenden. Total capacity of 52,100ML/a to irrigate 9,370 hectares for a cost of between $136 million to $279 million ($2015).<br>b) Coalstoun Lakes, Ban Ban Springs: Irrigation of the Coalstoun Lakes, Ban Ban Springs and Biggenden areas through a pipeline reticulation system pumped from a new storage. Pump station with main pipeline located parallel to Isis Highway. Total capacity of 42,690 ML/a to irrigate 8,200 hectares for a cost of between $136 million to $279 million ($2015). |

| Option 15 | Barambah Creek Dam at 43.0 km and irrigation network primarily for Coalstoun Lakes |
|---|---|
| | c) Coalstoun Lakes/Biggenden Water Development Group Irrigation Area including Biggenden: Irrigation of Coalstoun Lakes, Ban Ban Springs and Biggenden through a pipeline reticulation system pumped from a new storage. Pump station with main pipeline located parallel to Isis Highway. 3km tunnel to Biggenden. Total capacity of 52,100ML/a to irrigate 8,686 hectares for a cost of between $136 million to $279 million ($2015).<br>d) Coalstoun Lakes/Biggenden Water Development Group Irrigation Area excluding Biggenden: Irrigation of Coalstoun Lakes and Ban Ban Springs (not Biggenden) through a pipeline reticulation system pumped from a new storage. Pump station with main pipeline located parallel to Isis Highway. Total capacity of 49,200 ML/a to irrigate 8,200 hectares for a cost of between $115 million to $215 million ($2015). |
| Alignment with potential initiatives | Initiative 9: Build new headworks / off-stream storages and a new pipeline |
| Problems and benefits targeted | Sustained increases in agricultural production and employment |
| Category | New |
| Stakeholders | Potential irrigators |
| Adverse impacts and risks | The total cost is high, and the dam site requires more investigation to ascertain its suitability. |
| Water availability | This option would require substantial water from the Water Plan. While there is some unallocated water, it may not be sufficient, and additional water may be needed, potentially from Paradise Dam. However, there is not yet a decision on the future of Paradise Dam. |
| Timeframe | Long-term |

| Option 16 | Build a pipeline from Paradise Dam to Tarong – Wivenhoe pipeline via Coalstoun Lakes |
|---|---|
| Description | Vertical integration project with hydro electricity generation for pumping water to high demand areas with surplus electricity fed into the grid. Infrastructure: for water (170km pipeline, pump-stations, balance reservoirs, distribution networks); and energy (head and tail ponds, penstock, transmission). 170km pipeline connects Paradise Dam to Tarong-Boondooma Pipeline. Source 55GL from Paradise Dam.<br>▪ Stage 1a. Starting with a pump-station at Paradise Dam a pipeline would carry water at continuous duty to Buffer Storage which also serves as a Tail Dam for a pumped hydro installation. A gravity flow via Mt Hastings Creek would provide about 13.1GL of irrigation and augmented urban supply to Biggenden. Transmission losses of 25% and 3.2GL for evaporative losses were allowed for in this scenario. This scenario estimated a net cost of $229/ML for MP supply including a pipeline capex share of 25%. The estimate considered 75% and 100% utilisation to supply around 2000ha of cane, dairying and other irrigation uses.<br>▪ Stage 1b A 17 km pipeline from the buffer storage to Coalstoun Lakes supplying 21GL of MP irrigation water would be sufficient to irrigate 7,118ha at an annualised average of 5.0ML/ha/yr and a peak flow equivalent to 3.3mm/ha/day. In this scenario an estimated $241/ML cost of unpressurised supply for at 100% utilisation was derived. This is considered feasible for MP irrigation use with a marginal rate of return greater than the $250/ML for many crops currently grown in the area. The capital cost estimate included a provisional estimate for the distribution of irrigation water throughout the Coalstoun Lakes – Ban Ban Springs area through a flow-telescoped pipeline based on previous estimates by PPK for a similar area and application volume 5ML/ha/yr and the same unit rate ($2600/ha).<br>▪ Stage 2 Comprising Coalstoun Lakes to Tingoora via pipeline extension to AHD300 supplying about 8.9GL of irrigation water and up to 3.4GL of HP water for urban supplies in Wondai, Tingoora, Wooroolin and Memerambi en-route. This scenario identified and estimated a cost of supply of $602/ML for MP water at 100% utilisation. This is considered affordable for high value horticultural crops including wine grapes, vegetables and tree crops.<br>▪ Stage 3. Comprising Tingoora to Kingaroy/Boondooma via relift and pipeline interconnecting with the existing Tarong pipeline at Ellwoods Rd relift station. This scenario estimated the cost of medium priority irrigation supply at $802/ML 100% utilisation (considered potentially affordable only for high value horticultural uses, intensive animal production, urban and industrial use) and $1000/ML for high priority urban and industrial demand around Kingaroy.<br>Total cost is between $1.24 and $$1.73 billion. |

| Option 16 | Build a pipeline from Paradise Dam to Tarong – Wivenhoe pipeline via Coalstoun Lakes |
|---|---|
| Alignment with potential initiatives | Initiative 8: Build new pipeline from existing storages |
| Problems and benefits targeted | Sustained increases in agricultural production and employment |
| Category | New |
| Stakeholders | Water users who will be able to draw water from pipeline; current water users from the existing storages; Sunwater |
| Adverse impacts and risks | Total cost is very high and obtaining funding could be challenging.<br>Requires water from Paradise Dam, which is uncertain while the Government determines the best approach to Paradise Dam. |
| Timeframe | Long-term |
| Water availability | This option would require substantial water from the Water Plan. While there is some unallocated water, it may not be sufficient, and additional water may be needed, potentially from Paradise Dam. However, there is not yet a decision on the future of Paradise Dam. |
| Previous studies | Water Transfer and Hydro Storage, Eaglehawk Consulting (Steve Brown), 2018 |

| Option 17 | Build a pipeline from Paradise Dam to Boondooma Dam via Coalstoun Lakes |
|---|---|
| Description | 100km pipeline between Paradise Dam and Lake Boondooma to transfer surplus Paradise Dam Water Allocations. Multiple pump stations and 2.2MW of power required to manage elevation.<br>Routing pipeline through Coalstoun Lakes<br>Stored water (post transfer) to facilitate creation of new 20,000ha of irrigation areas<br>Resetting water allocations so that Tarong Power Station water requirements (30,000ML/year) are supplied from Wivenhoe.<br>Connecting the Wivenhoe, Boondooma and Paradise storages through formalising (making operational) the common terminations at Tarong. |
| Alignment with potential initiatives | Initiative 8: Build new pipeline from existing storages<br>Initiative 4: Greater utilisation of the Wivenhoe to Tarong pipeline to free up water in Boondooma Dam |
| Problems and benefits targeted | Sustained increases in agricultural production and employment |
| Category | New |
| Stakeholders | Sunwater, Tarong Power Station, Seqwater, Coalstoun Lakes irrigators |
| Adverse impacts and risks | Paradise Dam may no longer have surplus water, subject to the dam safety review |
| Timeframe | Long-term |
| Water availability | This option would require substantial water from the Water Plan. While there is some unallocated water, it may not be sufficient, and additional water may be needed, potentially from Paradise Dam. However, there is not yet a decision on the future of Paradise Dam. |
| Previous studies | Getting Water for Peanuts, Eaglehawk Consulting (Steve Brown), 2018 |

| Option 18 | Up to 100,000 ML dam or weir on Barambah Creek and irrigation network primarily for Coalstoun Lakes |
|---|---|
| Description | 100,000 ML dam at Barambah Creek with a distribution system for Coalstoun Lakes. Irrigation area – 3,500 ha, Water allocation – 21,000 ML for Coalstoun Lakes 3,000 ML for downstream users. A pipeline and channel scheme to take the water from the dam to the irrigation area, including balancing storages and relift, due to the gain in elevation.<br>Estimated cost is $98 million for the dam and $39 million for the irrigation network<br>Potential to increase agricultural revenues from $4 million to $55 million. |

| Option 18 | Up to 100,000 ML dam or weir on Barambah Creek and irrigation network primarily for Coalstoun Lakes |
|---|---|
| Alignment with potential initiatives | Initiative 9: Build new headworks / off-stream storages and a new pipeline |
| Problems and benefits targeted | Sustained increases in agricultural production and employment |
| Category | New |
| Stakeholders | Coalstoun Lakes Irrigators |
| Adverse impacts and risks | A dam would require an EIS, and other regulatory approvals.<br>Downstream users' existing rights need to be maintained. |
| Water availability | This option would require substantial water from the Water Plan. While there is some unallocated water, it may not be sufficient, and additional water may be needed, potentially from Paradise Dam. However, there is not yet a decision on the future of Paradise Dam. |
| Timeframe | Long-term |

| Option 19 | Agricultural supply chain improvements (e.g. local value add / increase processing of peanuts and blueberries) |
|---|---|
| Description | Develop a supply value chain for the region and address supply chain gaps and constraints. This review to understand the opportunities for local value add, local jobs and opportunities for processing to occur within the region (e.g. for peanuts and blueberries). Understand the impediments, particularly regarding economies of scales and reliability that could be addressed through additional / more reliable water sources. |
| Alignment with potential initiatives | Initiative 11: Identify impediments to supply chain expansion opportunities resulting from increased scale of agricultural production |
| Problems and benefits targeted | Emergence of efficient local supply chain industries, Improved community (urban) resilience and growth of efficient agricultural processing industries. |
| Category | Reform |
| Stakeholders | Irrigators, manufacturing businesses |
| Adverse impacts and risks | A local value-add supply chain may require an economy of scale beyond what the region can produce. |
| Timeframe | Short-term |

| Option 20 | Tarong Power Station to source more of its water from Wivenhoe Dam |
|---|---|
| Description | Tarong Power Station currently has two main sources of water for its operation and water security: Wivenhoe Dam and Boondooma Dam. The primary source is from Boondooma Dam, which is lower cost, and supplementary water is sourced from Wivenhoe Dam. During drought conditions Tarong Power Station often takes higher volumes from Wivenhoe Dam to preserve storage levels at Boondooma Dam (Stanwell have confirmed that in 2019-20 around 50% will be sourced from Wivenhoe Dam).<br>If Tarong Power Station was to utilise the water from Wivenhoe Dam more, there would be less usage of the Stanwell allocation held in Boondooma Dam, thus freeing up this water for other users in the region, including irrigators, urban and industrial. The option could potentially, wholly or partially, address the urban water security concerns in some or all of the towns in South Burnett.<br>It would be reasonable to compensate Tarong Power Station so that it is no worse off in terms of costs and water security. |
| Alignment with potential initiatives | Initiative 12: Tarong Power Station to source more of its water from Seqwater |
| Problems and benefits targeted | Improved community (urban) resilience and sustained increases in agricultural production and employment |
| Category | Better use |

| Option 20 | Tarong Power Station to source more of its water from Wivenhoe Dam |
|---|---|
| Stakeholders | Seqwater, Tarong power station, South Burnett Regional Council, industrial users |
| Adverse impacts and risks | Need to ensure additional supply from Wivenhoe Dam does not impact on Seqwater ability to meet its water security objectives. Need to ensure there is no adverse impact on water security for power generation. |
| Timeframe | Short-term |
| Interaction with other options | This option interacts with options that impact Boondooma Dam, as a reduction in take from Tarong would allow more water to be available in Boondooma Dam, which could be used for other users. Interaction with Options 1, 2, 4, 5, 21. |

| Option 21 | Tarong Power Station to source more of its water from manufactured water products |
|---|---|
| Description | The Luggage Point treatment plant provides purified recycled water to the Western Corridor Recycled Water pipeline. It is designed to supply water for urban use when dam levels drop below certain triggers.<br>When not needed for urban use, it may be possible for the recycled water to be supplied to the Burnett region through the Wivenhoe to Tarong pipeline, subject to operational, environmental and other considerations.<br>Likewise, if other manufactured water plants need to be kept running for operational reasons, but not for water security reasons, the water could be used by Tarong. This would reduce its reliance on Boondooma. The option could potentially, wholly or partially, address the urban water security concerns in some or all of the towns in South Burnett. |
| Alignment with potential initiatives | Initiative 12: Tarong Power Station to source more of its water from Seqwater |
| Problems and benefits targeted | Improved community (urban) resilience and sustained increases in agricultural production and employment |
| Category | Better use |
| Stakeholders | Seqwater, Tarong power station, South Burnett Regional Council, industrial users |
| Adverse impacts and risks | Need to ensure additional supply from Wivenhoe Dam does not impact on Seqwater ability to meet its water security objectives. Need to ensure there is no adverse impact on water security for power generation. |
| Timeframe | Short-term |

| Option 22 | Flood harvesting from Barambah Creek into Bjelke-Petersen Dam |
|---|---|
| Description | When there are significant inflows, pump water from Barambah creek, into Barker Creek to be stored in Bjelke-Petersen Dam. As Bjelke-Petersen Dam, is rarely full, there is capacity to improve the capture of water to be used by current and new irrigators. This option could also provide for pumper hydro opportunities. |
| Alignment with potential initiatives | Initiative 8: Build new headworks / off-stream storages and a new pipeline |
| Problems and benefits targeted | Sustained increases in agricultural production and employment |
| Category | Improve existing |
| Stakeholders | Sunwater, Barker Barambah irrigators |
| Adverse impacts and risks | Transferring a significant volume of water during flood events will be challenging.<br>Investigation of sites and proposed infrastructure has not been completed.<br>Downstream users' existing rights need to be maintained. |
| Timeframe | Medium-term |

| Option 23 | Convert Gordonbrook Dam to irrigation use |
|---|---|
| Description | Gordonbrook Dam is a 6,600 ML storage that provides urban water to Kingaroy. There are significant water treatment issues when the water falls below 50 per cent. |

| Option 23 | Convert Gordonbrook Dam to irrigation use |
|---|---|
| | To supplement the loss of urban supply, Kingaroy would need to increase its draw on Boondooma Dam, possibly by purchasing water allocations from Tarong Power Station |
| Alignment with potential initiatives | Initiative 14: Convert Gordonbrook Dam to irrigation use |
| Problems and benefits targeted | Sustained increases in agricultural production and employment |
| Category | Improve existing |
| Stakeholders | South Burnett Regional Council |
| Adverse impacts and risks | Kingaroy's water supply would be less diversified |
| Timeframe | Short-term |
| Interaction with other options | This option would require South Burnett Regional Council to replace this supply. Relevant options include options 4,5,20 and 21. |

# 9. Strategic focus

This section outlines the strategic approach for the assessment of the initiatives included in the Options Long List, and the methodology for identifying the initiatives that warrant further development in the Preliminary Business Case.

The approach and methodology used to assess the initiatives will comply with the requirements of the State Infrastructure Plan (SIP) and seek to identify low-cost initiatives that will provide practical outcomes and value to stakeholders. The Future Activities will facilitate the analysis of the prospective initiatives across each of the four categories.

## 9.1 Future Activities

The Preliminary Business Case will focus on the identification and development of the initiatives that provide the highest value to stakeholders and align with the strategic direction of regional, state and federal governments. The assessment process will include a range of activities directed at building at the selection of the most suitable initiatives for North and South Burnett.

The future activities in the Preliminary Business Case will include the assessment of the prospective initiatives in the Options Long List, and the development of planning instruments to guide the decision-making process.

The future assessment activities will include:

(a) Consultation, Research and Analysis

Identifying and understanding the costs and benefits of viable, prospective initiatives, including data collection and analysis, further interviews and public forums, and the review and assessment of existing proposals. This work will be conducted in weeks 1 to 4 of the Preliminary Business Case.

(b) Filtering Analysis and Eliminating Options

Development of a set of minimum criteria for an initiative to be considered viable on the basis of cost and benefits and filtering out initiatives that fail to meet that criteria.

(c) Consideration of strategic alignment

Assessment of prospective initiatives against the strategic direction and goals of all relevant levels of Government and potential synergies with other projects of national significance.

(d) Assessment of likely investment costs to realise benefits and potential funding gaps

Assessment of the magnitude of investment required to realise the stated benefits and/or address the Statement of Service Need including the potential funding gaps

(e) Consideration of integration between projects

Review of how each initiative may potentially integrate with other prospective initiatives, and the combination of initiatives that will best address the strategic requirements of North and South Burnett.

(f) Satisfaction of immediate and longer-term requirements

Identification and analysis of initiatives that satisfy both the short-, medium- and long-term requirements of North and South Burnett. This analysis will consider the optimal timing for initiatives for the region and identify initiatives that align with the regions strategic timing requirements.

## 9.2 Governance

The governance of this project is focused on the robust oversight of the assessment activities for both the Strategic Business Base and Preliminary Business Case. In accordance with Building Queensland best practice, appropriate governance structures have been established.

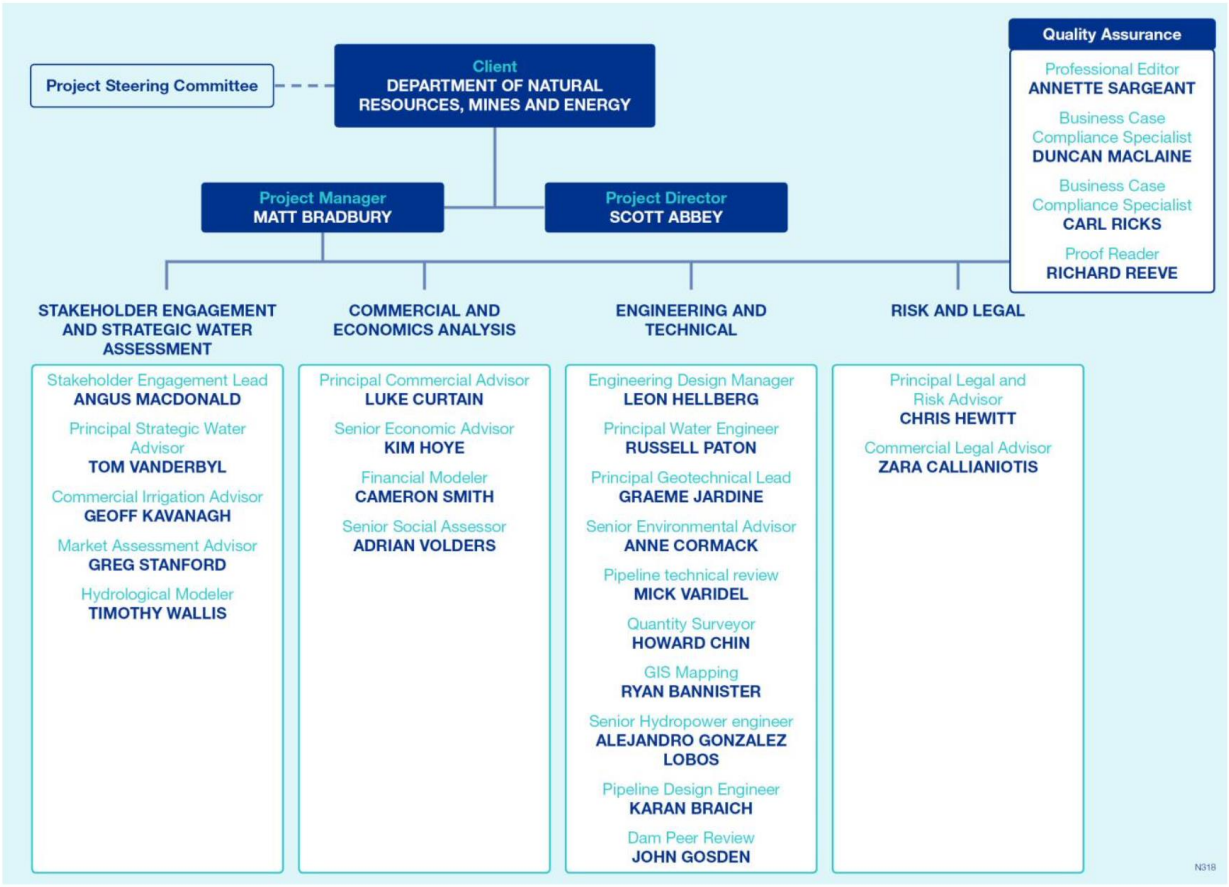
The governance structure for this project is shown in Figure 9.1. Within that governance structure, the roles of the key project participants are:

(a) Project Owner: Department of Natural Resources, Mines and Energy

(b) Project Steering Committee: Local Governments from the North and South Burnett regions

(c) Project Team: Team members and roles are outlined in Figure 9.1.

Figure 9.1: Governance Structure



# 10. Assurance

The assurance chapter can be completed by the client to outline the review process undertaken to approve this strategic business case report.

# 11. Conclusion and recommendation

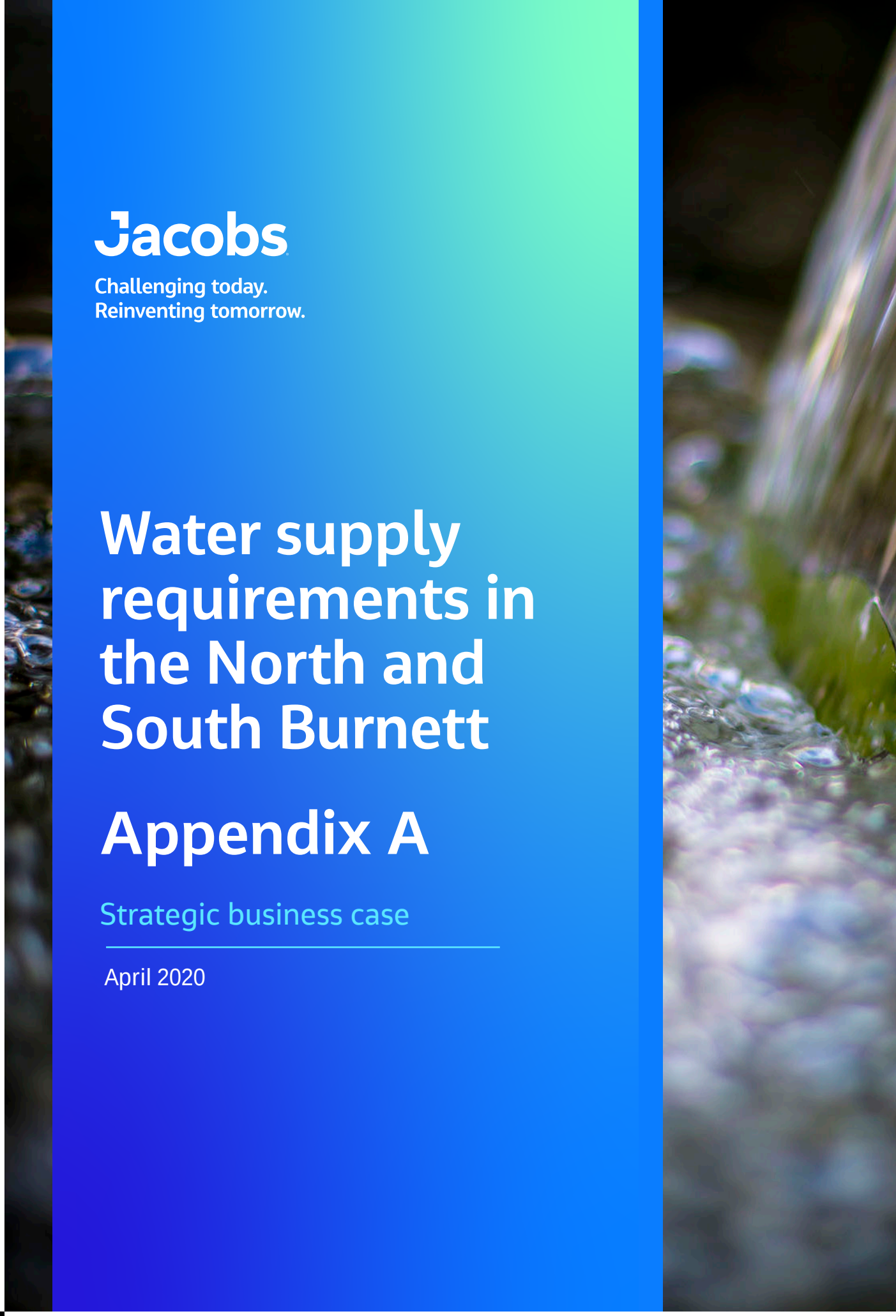
This strategic business case has identified some problems and opportunities that could be addressed in the North and South Burnett Regional Council Areas. The benefits of addressing these issues could be significant.

Building on the initiatives developed in the investment logic workshops, a long list of options for further consideration has been identified and each option has been described at a high-level.

These options will be further refined and assessed in the preliminary business case.

**Recommendation**

It is recommended that a preliminary business case should be undertaken to further refine and assess the identified options summarised in Table 8.1.



Jacobs

Challenging today.
Reinventing tomorrow.

# Water supply requirements in the North and South Burnett

# Appendix A

## Strategic business case

April 2020

# Appendix A. Summary of previous studies

The following table provides a detailed index of all documents reviewed as part of the literature review.

Table A.1: Detailed list of documents reviewed – general studies and proposals

| | | | | | |
|---|---|---|---|---|---|
| **1** | Discussion Paper | Regional Water Position Paper | 2018 | WBBROC | High-level detailed reference information on the operation of water demand, the market and role of water in the WBB economy. See further detailed description in Part 4. |
| **2** | Map | Paradise Dam Water Pipeline | 2016 | NBRC Assets Department | Map of pipeline from Paradise Dam to Biggenden (20.78km). |
| **3** | Report | Soils and Agricultural Suitability of the South Burnett Agricultural Lands | 2001 | DNRME | Report on the South Burnett Agricultural Survey, which measured cropping suitability (53% suitable for dryland cropping; 73% for dryland sown pastures; 48% for tree and vine crops). 80% of the survey area has been cultivated at some stage, with erosion and salinity issues impacting significant portions. |
| **4** | Plan | North Burnett Advocacy Action Plan | 2019 | North Burnett Regional Council | Confirms support for federal funding of the feasibility study to assess options for new water infrastructure in the North and South Burnett Regions. |
| **5** | News Article | Great Ideas…Just Add Water | 2018 | South Burnett Regional Council | Reports on the meeting of South Burnett water users and the ideas put forward by meeting attendees. References the importance of the feasibility study for the region. Ideas include TPS taking some supply from Wivenhoe Dam, water storage upstream of Barambah Station; Barlil Weir. |
| **6** | Advocacy Paper | Building the future trade potential of the Wide Bay Burnett | | WBBROC | This paper identifies the trade potential of WBBR and identifies the infrastructure priorities to exploit that potential. The paper focuses on transport infrastructure (port, rail, road) and gives limited priority water infrastructure (identified $23m investment in water storage and supply). |
| **7** | Research Paper | Water for Economic Development DSDMIP | 2018 | Marsden Jacobs 2017 | Overview of the availability and demand for water in WBB for urban, industrial and agricultural sectors. See further detailed description in Part 4. |
| **8** | Submission | Sunwater Irrigation Pricing Review Submissions | | WBBROC | The WBBROC submission raises multiple questions in relation to the formulation of pricing and suggests that pricing should reflect the value to the customer and not be subject to broad increases that impact irrigators equally with high priority water users. See further detailed description in Part 4. |
| **9** | Submission | Submission to the Rural Irrigation Price Review 2020-2024 | 2018 | NBRC | NBRC largely agrees with the WBBROC and LGAQ submissions to the review (see Document #8) and provides some further commentary that focuses on increased clarity in relation to North Burnett. |

| | | | | | |
|---|---|---|---|---|---|
| **10** | Presentation | Kingaroy RWSSA Hydrological Assessment – Water Supply Planning | 2019 | DNRME | The demands for Kingaroy are modelled with the assumption that water will be diverted from both Gordonbrook and Boondooma Dams.<br>Water restrictions are modelled and demonstrate that to achieve modelled reductions that drastic management measures would be required. Multiple scenarios are considered to model the water impact of water restrictions. Findings that an additional 1,300 ML/a would dramatically reduce fail frequency of water supplies. |
| **11** | Report | Soils of the Riparian Lands of the Burnett River | 1996 | DMNR | The soil assessment identifies that a high proportion of the land close to the Burnett River is suitable for irrigated cropping, and that there are extensive areas suitable for irrigation some distance from the Burnett River. See further detailed description in Part 4. |
| **12** | Strategy Paper | Economic Development and Innovation Strategy | | NBRC | Review of the economic and development opportunities and strengths of the region. Limited commentary on the role of water supply and security. |
| **13** | Feasibility Study | Bundaberg Channel Upgrade Feasibility Study | 2018 | Sunwater | This feasibility study examines potential irrigation expansion areas, including identification of potential customers and concept level engineering studies to determine the optimal methods of water conveyance to these areas, including estimated costs. An assessment between existing water prices and Paradise Dam water is undertaken to develop an appropriate approach to water pricing in the future. See further detailed description in Part 4. |
| **14** | Report | Queensland Regional Profile: South and North Burnett | 2019 | QLD Government | This report breaks down data for South and North Burnett in the areas of demography, society, economy, industry and development. |
| **15** | Policy | Queensland Bulk Water Opportunities Statement | 2018 | DNRME | This is the bulk water security strategy and direction statement for Queensland. This strategic infrastructure document provides a framework through which the Queensland Government can support and contribute to sustainable regional economic development through better use of existing bulk water infrastructure, and planning and investment in new infrastructure. |
| **16** | Report | Regional Water Supply Security Assessment - Bundaberg | 2016 | BRC<br>QLD Government | This report discusses the heavy reliance of the Bundaberg region on reliable and secure water resources for economic development. The region has a significant water allocation, with the vast majority of water supply capacity designated as medium priority for use by irrigators. There is a large volume of uncommitted water allocations, with the majority of that volume designated as medium priority. See further detailed description in Part 4. |
| **17** | Minutes | Stakeholder Meeting – Water Policy | 2018 | DNRME | Detailed minutes of stakeholder meeting that outlines the specific experiences of local irrigators. Consideration of how water management regulations could be changed to accommodate water requirements and be more considerate of irrigator needs in the region. Discussion of the ways to best service TPS and provide for the irrigator requirements when mandatory cut-off levels are approaching. Set down an action list for further investigations. |

| | | | | | |
|---|---|---|---|---|---|
| **18** | Map | Upper Burnett Sunwater Zones | - | Sunwater | Sets out the Sunwater Zones across the Upper Burnett. |
| **19** | Proposal | Water Proofing Wide Bay Burnett | 2017 | WBBROC | This proposal recommends significant infrastructure investment to increase storage capacity, create more efficient water transfers with new pipeline distribution and restructure the water pricing mechanisms. See further detailed description in Part 4. |
| **20** | Synopsis | WBBROC Regional Water Strategy Water Synopsis | 2017 | WBBROC | This synopsis provides a reference for publicly available sources on WBB water security discussions. The synopsis reviews the current position of water security and reliability in WBB and identifies the costs and lost opportunity of the current under-utilisation of water reserves in the region. See further detailed description in Part 4. |
| **21a** | Data Sheet | Water Use on Australian Farms 2017-18 | 2018 | ABS | - |
| **21b** | Data Sheet | Water Use on Australian Farms 2016-17 | 2017 | ABS | - |
| **21c** | Data Sheet | Water Use on Australian Farms 2015-16 | 2018 | ABS | - |
| **21d** | Data Sheet | Water Use on Australian Farms 2014-15 | 2015 | ABS | - |
| **22a** | Data Sheet | Value of Agricultural Commodities Produced 2017-18 | 2018 | ABS | - |
| **22b** | Data Sheet | Value of Agricultural Commodities Produced 2016-17 | 2017 | ABS | - |
| **22c** | Data Sheet | Value of Agricultural Commodities Produced 2015-16 | 2016 | ABS | - |
| **22d** | Data Sheet | Value of Agricultural Commodities Produced 2014-15 | 2015 | ABS | - |
| **25** | Proposal | Water Transfer and Hydro Storage Study | 2018 | Coalstoun Lakes Development Group Inc<br>Eaglehawk Consulting | Study proposes a project for the utilisation of surplus water and electrical power generation. See further detailed description in Part 4. |
| **26** | Discussion Paper | Getting Water for Peanuts | 2018 | Eaglehawk Consulting | Water transfer project with pipeline and pump infrastructure to better utilise allocation to service existing and new irrigation areas. See further detailed description in Part 4. |

| | | | | | |
|---|---|---|---|---|---|
| **27** | Proposal | Review for Lower Barambah Coalstoun Lakes Irrigation Scheme | 2015 | North Burnett Regional Council<br>GHD | Desktop review of previous studies in the Lower Barambah/Coalstoun Lakes Irrigation Scheme, and study of the viability of suitable water infrastructure. Report reviews the SKM (1996) study and PPK (1998) study. See further detailed description in Part 4. |
| **28** | Proposal | Barambah Creek Proposal | 2018 | Coalstoun Lakes Development Group Inc | Informal proposal for the development of a demand distribution system for Barambah Creek and Coalstoun Lakes. The proponent is confident in high and reliable take up of water allocations. See further detailed description in Part 4. |
| **29** | Supporting Document | Barambah Creek Scheme Schematic | 2018 | - | Schematic documents in support of Coalstoun Lakes Irrigation Scheme. |
| **30** | Report | Agricultural Land Resource Assessment of Coalstoun Lakes | 2000 | DNRME | This assessment was required to assess the potential for irrigation development to ensure sustainable agricultural development. The assessment identifies significant areas suitable for expanded agricultural production. Broadacre cropping is the dominant agricultural production in Coalstoun Lakes. See further detailed description in Part 4. |
| **31** | Proposal | Gayndah Regional Irrigation Development (GRID) Project – Detailed Business Case | 2018 | Isis Central Sugar Mill Co Ltd with support from NWIDF | Infrastructure works and water transfer from upstream on the Burnett River to make 24,000ML (approx.) available for the development of 5,000ha for sugarcane production and 1,200 for irrigated rotation cropping. See further detailed description in Part 4. |
| **33** | Letter | Water Resources Letter May 1980 | 1980 | - | Letter form the Boyne River Water Advisory Board requesting clarity on the priority for water for irrigators; soil survey of surrounding lands; water requirements for irrigation from the report; and plans for stage two. Response from the Minister confirmed that a percentage of water would be reserved for irrigation although urban and other uses would have a higher priority; advised that stage two would not proceed for a significant period. |
| **34** | Letter | Sunwater Letter 23 March 2017 | 2017 | Boyne River | Letter from Sunwater to Boyne River Irrigator Advisory Committee summarising the water infrastructure options for the Boyne catchment area. See further detailed description in Part 4. |
| **34a** | Presentation | Boondooma presentation – Cooranga Weir Modelling | 2018 | Boyne River | Presentation outlining the hydrological performance of the proposed Cooranga Weir |
| **35** | Letter | Sunwater Letter 5 June 2017 | Boyne River | Boyne River | Confirmed that Cooranga Weir is unattractive due to geotechnical and environmental issues. Sunwater set out a proposal for preliminary IQQM hydraulic modelling for Boondooma Dam raising. See further detailed description in Part 4. |
| **37** | Meeting Notes Part 1<br>(links to 38) | DNRME, Sunwater, Boyne Irrigator Meeting – 16 August 2018 | 2018 | DNRME | Reported on BIEDO survey results on water supply and impacts on TPS. The presentation argues that there is not currently sufficient justification to source TPS' substantive water requirements from Wivenhoe Dam, and that the impacts would outweigh the demand for MP water for irrigators. See further detailed description in Part 4. |

| | | | | | |
|---|---|---|---|---|---|
| **38** | Meeting Notes Part 2<br><br>(links to 37) | DNRME, Sunwater, Boyne Irrigator Meeting – 16 August 2018 | 2018 | DNRME, Sunwater, Boyne River irrigators | Reported that there is support from irrigators for the Cooranga Weir scenario, and that there are substantive benefits. However, the impact on p/ML cost would exceed the market willingness to pay. See further detailed description in Part 4. |
| **40** | Minutes | Cabinet Meeting Minutes – 1 June 1978 | 1978 | QLD State Government | Decision to construct 210,000ML dam on Boyne River for power station supply. |
| **41** | Minutes | Cabinet Meeting Minutes – 27 June 1978 | 1978 | QLD State Government | Amended the minutes from 1 June 1978 so that the capital costs of the project are apportioned as: Boyne River Dam (QEGB - 75%; IWSC – 25%); and Pumping Station and Pipeline (100% - QEGB). |
| **42** | Report | Irrigation from the Boyne River | 2019 | RECE<br><br>BIEDO | The study assesses the broad social and economic benefits of increased water availability in BRIA in the context of the proposed Cooranga Weir. The study determined that increasing irrigation water reliability from the current 73% to a future 88% would have a major economic impact on BRIA and the whole North Burnett Regional Council area. See further detailed description in Part 4. |
| **43** | Data Sheet | Boyne River Irrigators Meeting – 16 August 2018 (Attachment 1) | 2018 | BRI | Details of Simulated Boondooma Dam and Cooranga Weir Level Analysis |
| **44** | Map | Boyne River Irrigators Meeting – 16 August 2018 (Attachment 2) | 2018 | BRI | Map of Boyne River and Tarong WSS |
| **45** | Graph | Boyne River Irrigators Meeting – 16 August 2018 (Attachment 3) | 2018 | BRI | Boondooma Dam Releases compared to Cooranga Flow |
| **46** | Network Service Plan | Barker Barambah Bulk Water Service Contract | 2018 | Sunwater | The NSP outlines a short-term refurbishment and longer-term projects for the improvement of the Boyne River Tarong area by Sunwater. The primary infrastructure in this NSP region is Bjelke - Petersen Dam. The significant works for the five-year forward period are focused on Silverleaf Weir and assessments and works on Bjelke- Petersen Dam. |
| **47** | Network Service Plan | Boyne River Tarong Bulk Water Service Contract | 2018 | Sunwater | The NSP outlines a short-term refurbishment and longer-term projects for the improvement of the Boyne River Tarong region by Sunwater. The significant works for the five-year forward period are focused on assessments and works on Boondooma Dam. See further detailed description in Part 4. |
| **48** | Network Service Plan | Three Moon Creek Bulk Water Service Contract | 2018 | Sunwater | The NSP outlines a short-term refurbishment and longer-term projects for the improvement of the Boyne River Tarong area by Sunwater. The primary infrastructure in this NSP region is Cania Dam. The significant works for the five-year forward period are focused on assessments on Cania Dam and works on various weirs. See further detailed description in Part 4. |

| | | | | | |
|---|---|---|---|---|---|
| **49** | Annual Report | Permanent Water Trading Annual Report 2011-12 (Supplement) | 2012 | | Reporting on transfer of ownership in water allocations over the period in the Burnett Basin Water Plan, and specifically North and South Burnett, for the financial year. See number of transfers and total volume transferred data in Figure A.9. |
| **50** | Annual Report | Permanent Water Trading Annual Report 2012-13 (Supplement) | 2013 | | Reporting on transfer of ownership in water allocations over the period in the Burnett Basin Water Plan, and specifically North and South Burnett, for the financial year. See number of transfers and total volume transferred data in Figure A.9. |
| **51** | Annual Report | Permanent Water Trading Annual Report 2013-14 (Supplement) | 2014 | | Reporting on transfer of ownership in water allocations over the period in the Burnett Basin Water Plan, and specifically North and South Burnett, for the financial year. See number of transfers and total volume transferred data in Figure A.9. |
| **52** | Annual Report | Permanent Water Trading Annual Report 2014-15 (Supplement) | 2015 | | Reporting on transfer of ownership in water allocations over the period in the Burnett Basin Water Plan, and specifically North and South Burnett, for the financial year. See number of transfers and total volume transferred data in Figure A.9. |
| **53** | Annual Report | Permanent Water Trading Annual Report 2015-16 (Supplement) | 2016 | | Reporting on transfer of ownership in water allocations over the period in the Burnett Basin Water Plan, and specifically North and South Burnett, for the financial year. See number of transfers and total volume transferred data in Figure A.9. |
| **54** | Annual Report | Permanent Water Trading Annual Report 2016-17 (Supplement) | 2017 | | Reporting on transfer of ownership in water allocations over the period in the Burnett Basin Water Plan, and specifically North and South Burnett, for the financial year. See number of transfers and total volume transferred data in Figure A.9. |
| **55** | Annual Report | Permanent Water Trading Annual Report 2017-18 (Supplement) | 2018 | | Reporting on transfer of ownership in water allocations over the period in the Burnett Basin Water Plan, and specifically North and South Burnett, for the financial year. See number of transfers and total volume transferred data in Figure A.9. |
| **56** | Annual Report | Permanent Water Trading Annual Report 2018-19 (Supplement) | 2019 | | Reporting on transfer of ownership in water allocations over the period in the Burnett Basin Water Plan, and specifically North and South Burnett, for the financial year. See number of transfers and total volume transferred data in Figure A.9.<br>. |
| **57** | Report | Sustainable Water Alternatives for the Southern Burnett | 2004 | SWASB | Review of the relevant reports and studies on the water alternatives in the Kingaroy, Nanango, Rosalie and Crows Nest LGAs, and recommendations for implementing water strategies. |

| | | | | | |
|---|---|---|---|---|---|
| **58** | Report | Kingaroy Water Supply: Augmentation of Raw Water Supply | 1995 | KSC<br>John Wilson & Partners | The report was commissioned to investigate new water sources for Kingaroy and expanded treatment plant capacity. The report identified and analysed multiple options and recommended further action. |
| **59** | Report | Kingaroy Water Supply Planning Report – Development of Borefield | 1998 | KSC<br>John Wilson & Partners | Investigation of the development of a borefield south of Kingaroy to supplement existing supply from Gordonbrook Dam and delay the second raising of Gordonbrook Dam. |
| **60** | Report | Nanango Water Supply: Augmentation of Barker Creek Groundwater Supply | 1994 | NSC<br>John Wilson & Partners | Report on the program of bore hole investigations to identify viable options for additional supply of bore water in the NSC area. |

The following section provides a detailed summary of selected documents as part of the literature review.

## A.1 Regional Water Position Paper (2018 WBBROC)

### A.1.1 Summary

High-level detailed reference information on the current state of water demand, the operation of the water market and role of water in the economy (especially in WBBR).

### A.1.2 Key Features

- WBB has around 1,723GL of storage capacity in 30 regulated impoundments with a total stored volume averaging 56% of full capacity over the last 14 years ranging from 10% during the millennium drought to 100% after the 2013 flood event. There is an estimated additional 120GL of on-farm surface storage.
- Total available capacity of all sources is therefore around 2,317GL with 1,000GL held as strategic reserve (Figure A.1)
- The irrigation sector consumes over 82% of regulated water and most of the unregulated water. The largest irrigation use of water is the sugar industry which uses over half of all agricultural water or 44% of total consumption in the region (Figure A.2).
- The future outlook for projected annual demand against a reducing catchment yield would result in the surplus supply reducing to zero by 2050 and strategic reserves to 8 months (from the current 46 months). These estimates will be further impacted by planned expansion water demand from the irrigation sector.
- Position paper recommends further reviews of regulatory mechanisms, water trading rules, recycled water options and bulk water pricing.

Figure A.1: Representation of the volumes of various water classes in WBB (extracted from paper)

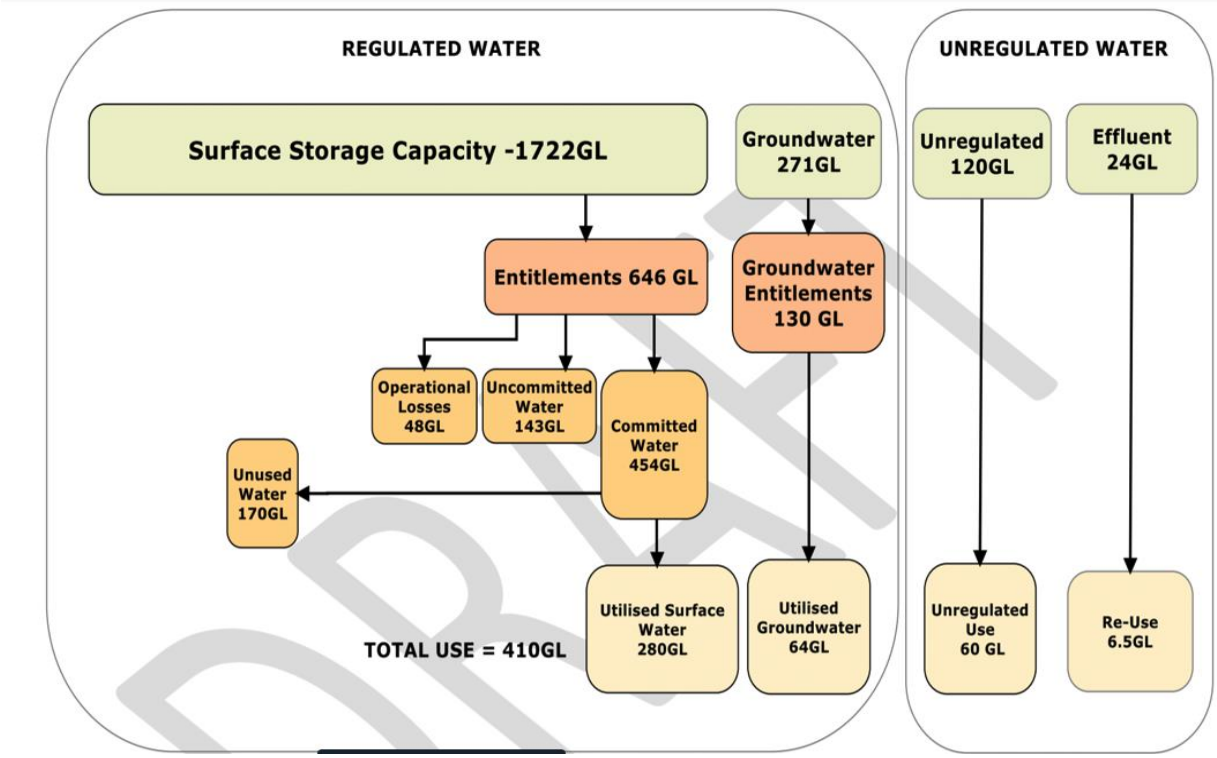
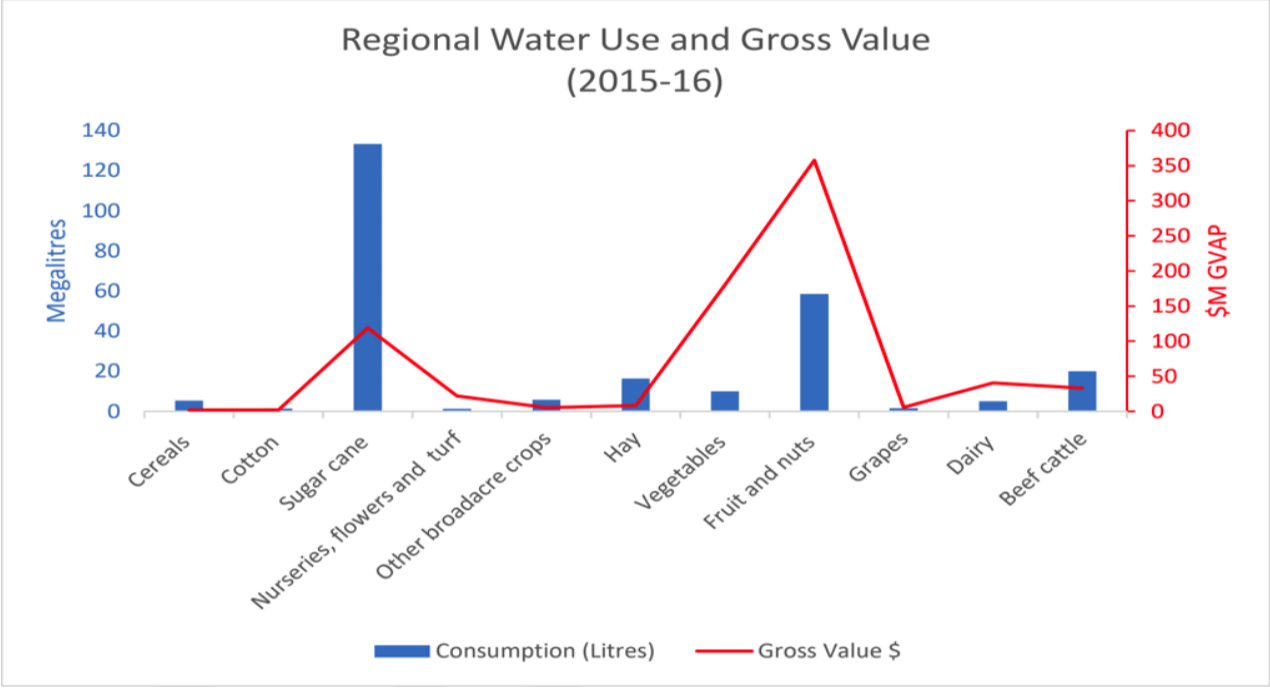



Figure A.2: Irrigation Water Use in WBB and Gross Value (extracted from paper)




## A.2 7. Water for Economic Development DSDMIP (Marsden Jacobs 2017)

### A.2.1 Summary

Overview of the availability and demand for water in WBB for urban, industrial and agricultural sectors.

### A.2.2 Key Features

- WBB has substantial water resources that are under-utilised. There is increasing water demand for agriculture and high value crops, although water resources are often not cost-effectively available in areas of existing or potential demand.
- Urban demand is largely secured, although some smaller centres will require longer term planning for secure water resources.
- The authors of the report are unwilling to give assurances or confidence to their forward demand estimates due to the fluid nature of customer requirements for water resources.
- Decline in agriculture-based employment, and a slowing population growth rate that is below the Queensland average.
- Top agricultural outputs: cattle and calves; sugar cane; pigs; mandarins; macadamias; avocadoes and various vegetables.
- General commentary on the water access, strategy and regulatory considerations, and some suggestion son how to streamline and simplify water management and access in WBB.
- The water trading market is immature, unreliable and impacted by limited and (allegedly) inaccurate reporting and public information. It is believed that this is resulting in large parcels of water are being locked up in underutilised small holdings.
- Summarised the unused and uncommitted surface water allocations and unallocated strategic reserve. The causes of the low utilisation of allocations is caused by reliability and security concerns; concerns regarding the commodity markets; and poor timing. Paper summarises current sources of demand.

## A.3 8 Sunwater Irrigation Pricing Review Submissions by WBBROC

### A.3.1 Summary

The WBBROC submission raises multiple questions in relation to the formulation of pricing and suggests that pricing should reflect the value to the customer and not be subject to broad increases that impact irrigators equally with high priority water users.

### A.3.2 Key Features

- WBBROC seeks assurances that bulk water price paths are reflective of state and national benchmarks.
- WBBROC argues against nominal price increases and advocates for pricing to reflect the value to the customer, and Sunwater should be prevented from applying monopoly rents on customers.
- Raised concerns regarding the impact of the reduction in the Paradise Dam capacity or yield on water availability and reliability.
- Suggested that the capital costs for the proposed Dam Safety Upgrade should be recovered from users on a value-weighted basis, with high priority classes providing the higher contribution.

## A.4 11 Soils of the Riparian Lands of the Burnett River

### A.4.1 Summary

The assessment of the soils identified that a high proportion of land close to the river is suitable for irrigated cropping, and that there are extensive areas suitable for irrigation some distance from the Burnett River.

### A.4.2 Key Features

- During 1991 to 1992, soils were examined up to 5 km north and south from the general course of the Burnett River between Mundubbera and Gayndah.
- The survey covered 38,890 ha. Geological formations include recent alluvia near streams, relict alluvia, sedimentary rocks, basalt and granite.

- A total of 48 soils were identified, which can be categorised as one of seven major soil groups. The lands are assessed in terms of land suitability for growing asparagus, avocados, chickpea, citrus, cruciferae, cucurbits, grapes, lucerne, mango, mungbean, navybean, improved pastures, peanut, pecan, potato, safflower, soybean, stone fruits, summer grains, sunflower, vegetables and winter grains.
- A high proportion of land close to the river is suitable for irrigated cropping. Extensive areas suitable for irrigation occur distant from the river, while some are also elevated, being on plateaux.
- This study area has the potential to develop salinity and waterlogging problems under irrigation. Even clearing has altered the hydrologic balance and resulted in the development of seeps or salinity in small areas.

## A.5 13 Bundaberg Channel Upgrade Feasibility Study (Sunwater 2018)

### A.5.1 Summary

This feasibility study examines potential irrigation expansion areas, including identification of potential customers accompanied by concept level engineering studies to determine the optimal methods of water conveyance to these areas, including estimated costs. An assessment between existing water prices and Paradise Dam water is undertaken to develop an appropriate approach to water pricing in the future.

### A.5.2 Key Features

- Existing water allocations in the BWSS have been considerably underused in recent years.
- Little demand for Paradise Dam and Kirar Weir high priority water the exists.[11]
- Substantial demand for Paradise Dam and Kirar Weir medium-priority water allocations exists but requires lower pricing and additional infrastructure to deliver water.
- Consequential impacts of the sale of "new" water allocations on the holders of current allocations are manageable.
- The water market in the area could improve with more transparent sales data.
- Study considered multiple prospective infrastructure projects: North of the Elliot River (highest prospective demand); South of the Elliot River highest prospective demand); Wallaville highest prospective demand); Promisedland; Farnsfield; Turpentine Road; and Gayndah. The location of these projects is shown in Figure A.3 and the basic financial modelling for each project in shown in Figure A.4.
- The Study proposes a reduction in the shelf price of medium priority water ($550/ML) to drive demand and meet the market price expectations. Fixed and variable charges would remain unchanged and high priority water would not be discounted.
- Prospective demand drivers are sugar; tree crops (macadamias, avocados, mangoes and citrus); other crops (berries, peanuts and selected vegetables); mining (subject to substantive delays and uncertainty).

[11] The Upper Burnett Water Supply Scheme Operations Manual 2020 provides that a holder of high priority water rights in the area of Kirar Weir (Zone OC) may enter into a seasonal water assignment to transfer high priority water to selected other zones provided the take volume is less than (or equal to) 350ML and greater than (or equal to) 200ML.

Figure A.3: Locality Plan of Prospective Projects (extracted from paper)


Figure A.4: Financial Modelling (extracted from paper)

| | Capital Cost ($ ‘,000) | Water able to be sold (ML) | Unit Capital Cost ($ per ML) | Grant Required ($ ‘,000) |
|---|---|---|---|---|
| North of the Elliot River | 20,160 | 7,200 | 2,800 | 15,235 |
| South of the Elliot River | 23,750 | 6,150 | 3,862 | 18,237 |
| Wallaville | 13,850 | 8,600 | 1,610 | 7,965 |
| Promisedland | 16,690 | 1,000 | 16,690 | 9,700 |
| Farnsfield | 44,950 | 3,700 | 12,148 | 18,448 |
| Turpentine Road | 9,500 | 5,000 | 1,900 | 5,825 |
| Gayndah | 116,380 | 24000 | 4,849 | n/a |
| Isis Main Channel Upgrade | 10,388 | n/a | n/a | 9,705 |
| **Total** | **245,280** | **55,650** | n/a | **75,410** |

## A.6 16 Regional Water Supply Security Assessment – Bundaberg (2016 BRC & QLD Government)

### A.6.1 Summary

The Bundaberg region is heavily reliant on reliable and secure water resources for economic development. The region has a significant water allocation, with the vast majority of water supply capacity designated as medium priority for use by irrigators. There is a large volume of uncommitted water allocations, with the majority of that volume designated as medium priority.

### A.6.2 Key Features

- The report provides a review of the current state of water availability in the Bundaberg region, and identifies the key needs and opportunities. Safe, secure and reliable water supplies are critical for sustaining economic growth in the area, as well as for the well-being of the community.

- The BWSS has a total water supply capacity of 44,372 ML/a of HP allocations and 335,957 ML/a MP allocations.
- Approximately 110,000 ML of the MP water allocation and 17,000 ML of the HP water allocation is not committed.
- The majority of the water is used by agricultural businesses across the Lower Burnett area, with Council's supplies from the BWSS representing only a small component of the scheme's available supplies.
- The water supply capability of the BWSS is supported by water stored in Paradise Dam (capacity of 300,000 ML) on the Burnett River and Fred Haigh Dam (capacity of 562,000 ML) on the Kolan River.
- Figure A.5 demonstrates the assumed use of BWSS water allocations at various modelled scenarios.

Figure A.5: Assumed use of water allocations (extracted from paper)

| | | Assumed use of BWSS water allocations (ML/a) | | | | |
|---|---|---|---|---|---|---|
| | | Council (all HP) | | Others + uncommitted | | |
| | Scenario | Bundaberg network* | Other communities | HP | MP | Combined total |
| 1 | Current use | 3060 | 1156 | 17 463 | 224 309 | 245 988 |
| 2 | Current use + 25% of unused allocation** | 4220 | 1256 | 21 875 | 252 221 | 279 572 |
| 3 | Current use + 50% of unused allocation** | 5380 | 1356 | 26 288 | 280 133 | 313 157 |
| 4 | Current use + 75% of unused allocation** | 6540 | 1456 | 30 701 | 308 045 | 346 742 |
| 5 | Full use | 7702 | 1556 | 35 114 | 335 957 | 380 329 |

## A.7 19 Water Proofing Wide Bay Burnett (2017 WBBROC)

### A.7.1 Summary

This proposal recommends significant infrastructure investment to increase storage capacity, create more efficient water transfers with new pipeline distribution and restructure the water pricing mechanisms.

### A.7.2 Key Features

- Increasing storage by raising the height of Borumba and Boondooma Dams (increasing storage from 915GL to 2,650GL).
- Development of new pipelines to facilitate water transfer between basins, restructure water pricing mechanisms.
- Offset bulk water costs with 20MW of hydro-electric power.
- Total cost of 1.573b with an estimated payback period of 13 years.

### A.7.3 Benefits

- Sustained annual employment growth of 2.7% to 2027.
- Directly create 500 construction jobs.
- Export stored surplus water between basis and direct it to highest value areas.
- No new dams are required.

## A.8 20. WBBROC Regional Water Strategy Water Synopsis (2017)

### A.8.1 Summary

The synopsis provides a reference for publicly available sources on WBB water security discussions. The Synopsis reviews the current position of water security and reliability in WBB and identifies the costs and lost opportunity of the current under-utilisation of water reserves in the region.

### A.8.2 Key Features

- WBBROC estimates that WBB consumed 380 gigalitres in 2015 and this will increase by 135GL/a by 2036 at current rates of consumption, water use efficiency and utilisation.
- 140GL of un-committed water is available to meet current and future demand and opportunities, subject to necessary infrastructure development and regulatory and behavioural changes.
- Regional utilisation of available supply is 47%. Estimated that increasing consumption by 135GL could increase GRP from $2.6b to $3.3b. The opportunity cost of under-utilising surplus water is estimated between $80m and $120m annually.

The proper allocation and distribution of the regions water resources is important.

## A.9 25. Water Transfer and Hydro Storage Study (Coalstoun Lakes Development Group Inc and Eaglehawk Consulting 2018)

### A.9.1 Summary

Study proposes a project for the utilisation of surplus water and electrical power storage, allowing access to 72GL for inland Burnet and building a complimentary revenue stream from power generation.

### A.9.2 Key Proposal Features

- Vertical integration project that utilises water to generate electricity, and then uses that electricity to pump the water to higher areas of high demand and send the surplus electricity to the power grid. The project will utilise PHES for energy storage.
- Capital investment into water infrastructure (pipelines, pump-stations, balance reservoirs, distribution networks) and energy infrastructure (head and tail ponds, penstock, transmission infrastructure incorporated into a PHES facility).
- Infrastructure includes 170km pipeline that connects Paradise Dam to the Sunwater pipeline supplying the Tarong Power Stations from Boondooma Dam. This allows the water from Paradise Dam to augment the Boondooma supply and build those storage levels at Boondooma for security and power generation.

### A.9.3 Benefits

- Development of 15,500 ha for agriculture in an area well connected with food processing facilities and domestic and export infrastructure.
- 1,350 direct permanent jobs plus up to 4,725 indirect jobs.
- Anticipated high EBITDA rate of return (19-39%) on PHES based on PHES capital unit rates, with a guaranteed 9% rate of return and full capital recovery over 30 years on $833m public investment (in addition to commercial returns).
- GRP of $790m (6% of regional economy) and combined taxation receipts of $618m.

### A.9.4 Supporting information

- The return on irrigation water use in the WBB is 12 to 13 times the state average for all agriculture water use.
- A significant proportion of the regions 1,700GL of storage capacity is currently available as under-utilised water entitlement and at a nominal market value of $133 million, comprises about half of the State's un-used regulated reserves.
- Proposal seeks to align the Powering Queensland Plan (strategy for power generation and management that includes pumped storage generation capacity) and the Queensland Bulk Water Opportunity Statement.

## A.10 26. Getting Water for Peanuts (Unstated)

### A.10.1 Summary

Proposal seeks to exploit the unused allocations in the WBBR, particularly in Lower Burnett. There are currently 100GLin MP allocations available from Paradise Dam at an allocation price of $937/ML (plus ongoing bulk water charges of $45/ML).

### A.10.2 Key Proposal Features

- Development of 100km pipeline between Paradise Dam and Lake Boondooma (Figure A.6 and Figure A.4) to transfer surplus water to Lake Boondooma and the Gayndah Region via the existing Boyne River Irrigation Scheme and to the South Burnett via the existing Tarong-Boondooma Pipeline.
- Multiple pump stations would be required and 2.2MW of power is necessary to manage the elevation difference.
- Routing pipeline through Coalstoun Lakes to irrigate a new 4,000ha irrigation area.
- Stored water (post transfer) can be held for distribution, facilitating the creating of 20kha of new irrigation areas and increase reliability for existing users.
- Resetting water allocations so that Tarong Power Station water requirements (30,000ML/year) are supplied from Wivenhoe. This would allow the Boondooma-Tarong pipeline to supply irrigation water to the target area around Kingaroy with available allocations from Boondooma, providing the Boyne Irrigation Scheme with a more reliable supply and allows a regulatory review of the 77GL strategic HP reserve held in Boondooma for Tarong.
- Connecting the Wivenhoe, Boondooma and Paradise storages through formalising (making operational) the common terminations at Tarong.

### A.10.3 Benefits

- Proposal would create 2,700 new jobs (direct and indirect)
- Capital investment of $425m with annual return of $490m, based on using the Murray Darling Basin agricultural economic multiplier of 3.5.

### A.10.4 Supporting information

- The Isis Sugar Ltd proposal to expand sugarcane production by 500,000 tonnes in Gayndah/ Coalstoun Lakes would require 24GL.There is a competitive proposal to send 24GL (approx.) to Mary Basin for Maryborough Sugar Ltd.
- Urban and industrial usage is peripheral, with the additional water providing greater security.
- Boondooma has had a steady decline in available volume and has a strategic cut-off of 77,000ML (no irrigation water below this level).
- Significant areas of existing irrigation area (67,000 ha) would receive greater access to HP water, and new areas (60,000 ha) would receive allocations. Based on 50% utilisation of the new areas, the requirement is for 80GL of the existing entitlement of 120GL.

Figure A.6: Route of Proposed pipeline from Paradise Dam to Lake Boondooma with route shown in white (extracted from paper)


## A.11 27. Review for Lower Barambah / Coalstoun Lakes Irrigation Scheme (North Burnett Regional Council & GHD)

### A.11.1 Summary

Desktop review of previous studies in the Lower Barambah/Coalstoun Lakes Irrigation Scheme, and study of the viability of suitable water infrastructure. Report reviewed the SKM (1996) study and PPK (1998) study.

### A.11.2 Key Features

- SKM (1996) study identified two options: Irrigation of the Coalstoun Lakes and Ban Ban Springs areas through a pipeline reticulation system pumped from new storage. The second option added irrigation of the Biggenden area with upgrades to pump stations, pipelines and storage capacity.
- PPK (1998) study investigated the SKM options plus larger versions of each of those two proposals.
- The estimated costs of the four options are outline in Figure A.7. GHD has updated the PPK cost estimates for 2015 and a cost estimate for alternative glass reinforced pipes.
- The size of the irrigation area and water allocation for each of the four options are outlined in Figure A.8.
- The new storage considered for these four options was originally a 210,000ML dam, although the GHD report generally discussed alternative, more cost effective, options including off-stream storage and water harvesting; a smaller dam or weir; transfer of unallocated water entitlement from Paradise Dam; and water trading.

Figure A.7: Estimated costs of options (extracted from paper)

**Table 1 Summary - irrigation system cost estimates**

| Scheme Options | Previous Cost Estimates (PPK, 1998) | Updated Cost Estimates (GHD, 2015) | |
|---|---|---|---|
| | | Based on PPK pipe selection | Based on alternative pipe selection |
| Updated Irrigation Area including Biggenden | $80.0 M | $278.9 M | $135.9 M |
| Updated Irrigation Area excluding Biggenden | $72.5 M | $226.0 M | $123.5 M |
| CLBWDG Irrigation Area including Biggenden | $81.2 M | $279.1 M | $134.9 M |
| CLBWDG Irrigation Area excluding Biggenden | $68.8 M | $215.2 M | $114.6 M |

Figure A.8: Dimensions and requirements for options (extracted from paper)

**Table 7 PPK sizing of irrigation scheme infrastructure**

| Description | Updated Irrigation Area including Biggenden | | | Updated Irrigation Area excluding Biggenden | | | CLBWDG Identified Irrigation Area including Biggenden | | | CLBWDG Identified Irrigation Area excluding Biggenden | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Design Criteria** | | | | | | | | | | | | |
| Irrigation Area | 9,730 ha | | | 8,200 ha | | | 8,686 ha | | | 8,200 ha | | |
| Water Allocation | 52,100 ML/a | | | 42,690 ML/a | | | 52,100 ML/a | | | 49,200 ML/a | | |
| **Pump Stations** | **Flowrate (L/s)** | **Head (m TDH)** | **Power (kW)** | **Flowrate (L/s)** | **Head (m TDH)** | **Power (kW)** | **Flowrate (L/s)** | **Head (m TDH)** | **Power (kW)** | **Flowrate (L/s)** | **Head (m TDH)** | **Power (kW)** |
| P1 (120 m AHD) | 6,340 | 24 | 1,884 | 5,835 | 24 | 1,721 | 7,291 | 25 | 2,200 | 6,021 | 24 | 1,781 |
| P2 (140 m AHD) | 6,340 | 71 | 5,484 | 5,835 | 69 | 4,909 | 7,291 | 75 | 6,666 | 6,021 | 96 | 5,116 |
| P3 (200 m (AHD) | 4,464 | 86 | 4,681 | 3,268 | 89 | 3,568 | 5,129 | 87 | 5,481 | 3,373 | 90 | 3,705 |
| P4 (265 m AHD) | 1,142 | 75 | 1,049 | 1,562 | 75 | 1,435 | 703 | 75 | 646 | 896 | 75 | 823 |
| **Reservoirs** | | | | | | | | | | | | |
| R1 (200 m AHD) | 162 ML | | | 222 ML | | | 187 ML | | | 229 ML | | |
| R2 (280 m AHD) | 108 ML | | | 147 ML | | | 203 ML | | | 214 ML | | |
| R3 (340 m AHD) | 99 ML | | | 135 ML | | | 61 ML | | | 77 ML | | |
| **Pipelines** | | | | | | | | | | | | |
| Rising Mains | 24.1 km total length Sized from DN750 to DN1800 3-km tunnel to Biggenden Outfall | | | 20.5 km total length Sized from DN825 to DN1750 | | | 24.1 km total length Sized from DN675 to DN1800 3-km tunnel to Biggenden Outfall | | | 20.5 km total length Sized from DN675 to DN1750 | | |
| Laterals | 65.3 km of total length Sized from DN100 to DN750 | | | 65.3 km of total length Sized from DN100 to DN750 | | | 52.4 km of total length Sized from DN100 to DN750 | | | 52.4 km of total length Sized from DN100 to DN825 | | |

## A.12 28. Barambah Creek Proposal (Coalstoun Lakes Development Group Inc)

### A.12.1 Summary

Informal proposal for the development of a dam and distribution system for Barambah Creek and Coalstoun Lakes. The proponent is confident in high and reliable take up of water allocations.

### A.12.2 Key Proposal Features

- 3,500ha of new irrigation land
- 24,000ML (21,000 for Coalstoun Lakes; 3,000ML for downstream users)

- 100,000ML dam at Barambah Creek ($98m)
- Distribution system for Coalstoun Lakes ($38.86m)
- Coalstoun Lakes to purchase allocation for $1,400/ML (a $29m proponent contribution)

### A.12.3 Benefits

- Expected 75% immediate take up by existing farming community. Expected 90% take up in 5 years.
- Fertile and highly productive soils, and with a reliable water source could convert the area into an extremely productive cropping district with minimal environmental impact.
- Proposal estimates that with the irrigation scheme production will increase from $4m to $55m.

### A.12.4 Supporting Information

- Elevation issues with the project mean that there will be high pumping costs.
- This proposal relies on the GHD Review (see Document #27).

## A.13 30. Agricultural Land Resource Assessment of Coalstoun Lakes (DNRME)

### A.13.1 Summary

This assessment was required to assess the potential for irrigation development to ensure sustainable agricultural development. The assessment identified significant areas suitable for expanded agricultural production. Broadacre cropping is the dominant agricultural production in Coalstoun Lakes.

### A.13.2 Key Features

- 15 different soils have been identified and their distribution mapped. The dominant soils are black and grey cracking clays (Vertosols) and non-cracking red clay soils (Ferrosols), red and brown structured gradational soils (Dermosols) and sodic texture contrast soils (Sodosols).
- Over 50% of the area mapped (3995 ha) are Ferrosols developed on basalt. These soils are suited to a wide range of agricultural and horticultural crops. In the remaining area, 25% of the area are soils developed on alluvium and colluvium (1996 ha), soils formed on Biggenden Beds (775 ha) or on a range of geologies with slopes greater than 8%
- A total of 6,290 ha suitable for sugarcane, 5,793 ha for asparagus, cruciferae and vegetables, 5,713 ha for beans, 5,793 ha for cucurbits, 4,190 ha for lucerne, 5,580 ha suitable for navy bean and potato, 4,596 ha for sorghum, 4,418 ha for soybean, 4,596 ha for sweet corn, 5,660 ha for sweet potato, 6,281 ha for avocado, macadamia, citrus, lychee and mango, 4,325 ha for grapes, 4,288 ha for stonefruit, 4,781 ha for peanuts, 4,595 ha for maize and 6,591 ha for pasture.
- The possibility of future salinisation in some areas will affect future irrigation management within the Coalstoun Lakes area.
- Future irrigation systems will need to be designed so as the amount of water being applied does not exceed crop uptake needs, and monitoring be undertaken to ensure irrigation management is sustainable.
- The average annual rainfall for the area is 772.9 mm. Approximately 70% of the total rainfall occurs in the summer months of October to March.

## A.14 31. Gayndah Regional Irrigation Development (GRID) Project – Detailed Business Case (Isis Central Sugar Mill Co Ltd with support from NWIDF)

### A.14.1 Summary

Infrastructure works and water transfer from upstream on the Burnett River to make 24,000ML (approx.) available for the development of 5,000ha for sugarcane production and 1,200 for irrigated rotation cropping in the area north of Gayndah.

### A.14.2 Key Proposal Features

- Transfer downstream of unused water allocations from further upstream on the Burnett River (10,469ML from upstream relating to reinstating the medium priority water allocations associated with the decommissioned fabri-dam at Claude Wharton Weir).
- Accessing the existing Strategic Water Infrastructure Reserve assigned to the Upper Burnett system as a new water harvesting product
- Reinstating the previous 1.5 m raising of the Claude Wharton Weir full supply level by installing crest gates
- Installation of a major pump station adjacent to the Burnett River at AMTD 184 km (approx.) and pumped main delivering water to a 10,000 ML (approx.) off-stream storage
- Installation of approximately 42 km of pipeline and associated infrastructure to supply water to irrigated cropping in the form of a water distribution network that will supply multiple farm off-takes across the network.
- Network consists of: Wetheron (irrigated area east of Burnett River); Reid's Creek East (between Reid's Creek and Burnett River); Reid's Creek West (west of Reid's Creek)
- Making available approximately 24,000 ML for irrigated crop production
- Development of over 5,000 ha of annual irrigated sugarcane production
- Development of over 1,200 ha of irrigated rotation cropping (including 50% fallow)

### A.14.3 Benefits

- Generate over 100 direct full time equivalent (FTE) jobs plus indirect employment
- Production of an additional 70,000 tonnes (approximately) of sugar annually for export through the Port of Bundaberg
- Potential generation of over 17,000 MWh of renewable energy per year from the existing co-generation facility

### A.14.4 Supporting Information

- Overall capital cost of $281m (including rail and land cost). Project requires non-recoverable government funding of $170m (approx.)
- Project relies on the re-establishment of the old Gayndah rail corridor to provide the efficient transport of sugarcane to the mill, which is being independently progressed by ICSM (though costings included in proposal overall cost).

## A.15 34. Sunwater Letter, 23 March 2017 (Boyne River)

### A.15.1 Summary

Summary of the position of Sunwater in relation to two infrastructure projects for the Boyne catchment: Boondooma Dam Raising; and Construction of Cooranga Weir. Sunwater are critical of the financial and regulatory feasibility of the Boondooma Dam Raising option. Sunwater are also critical of the Construction of Cooranga Weir option based on value and the time periods require to obtain necessary approvals.

### A.15.2 Key Proposal Features

- Boondooma Dam Raising – raising wall by 12 metres using fixed crest structure without gates to increase capacity by 396,000 megalitres.
- Construction of Cooranga Weir – between 2,200 and 5,350 ML depending on the site selected.

### A.15.3 Benefits

- Boondooma Dam Raising – Data is not presently available to determine the additional water allocation volume that would result from the raising. Anticipated that the benefits would be increased reliability and allocations.
- Construction of Cooranga Weir – increased reliability.

### A.15.4 Supporting Information

Boondooma Dam Raising – A full EIS would likely be required, in addition various state-level regulatory reviews and approvals taking a minimum of 6 years, with 10+ years of environmental monitoring required post construction. Estimated cost of $110m, including approvals.

Construction of Cooranga Weir – two locations have been considered previously; the location at 34.45km ATMD was found to be structurally unsuitable; require a full EIS, $25m required, including approvals; if used to increase water security then it would result in $200/ML cost increase; development timeframe of 4-5 years.

Significant changes would be required to the Burnett Basin Water Plan to support the creation of unallocated water provisions for either project.

## A.16 35. Sunwater Letter to Boyne River Irrigator Advisory Committee, 5 June 2017

### A.16.1 Summary

Confirmed that Cooranga Weir is unattractive due to geotechnical and environmental issues. Sunwater set out a proposal for preliminary IQQM hydraulic modelling for Boondooma Dam raising. Sunwater then addressed some additional issues raised by the BRIAC.

### A.16.2 Key Features

- Sunwater confirms that it is not responsible for micro-weirs and suggests that irrigators connect with DNRM.
- Sunwater stated that they have no knowledge of any plan for TPS to reduce its power usage.
- Sunwater suggested some approaches for maximising the efficiency and effectiveness of pumping and water use in Boyne River scheme.

## A.17 37. DNRME – Sunwater – Boyne Irrigator Meeting – 16 August 2018, Part 1

### A.17.1 Summary

The presentation argues that there is not currently sufficient justification to source TPS' substantive water requirements from Wivenhoe Dam, and that the impacts would outweigh the demand for MP water for irrigators.

### A.17.2 Key Features

- Survey respondents indicated alternative supply and others with contingency plans.
- If accessing Boondooma Dam water the shortfalls would be 760ML 1 Sep – 31 Dec and 1,020 1 Jan – 30 Jun.
- Details on historical background of the dam funding and apportionment of capital cost and charges.
- Detailed account of the history of the cut-off rule including the communications between the Boyne River Advisory Board and the Minister and confirmation that the 70,000ML MP (irrigators) cut off rule remains

despite multiple regulatory changes since 1987. Sunwater manages the delivery of HP (power station and town water supply) and MP.

- Practical measure put in place to facilitate better release decision making and efficient delivery of water to irrigators.
- The water usage at Tarong Power Station (TPS) can equate to 50ML/day subject to conditions, although improving efficiency of cooling towers would be a major infrastructure investment.
- TPS water strategy has included water efficiency measures and alternative sources, including supplementing water allocation from Boondooma Dam with water from Wivenhoe to delay cut offs (this cost $6m in FY18); and regularly operating the Wivenhoe Pipeline to target off peak electricity tariffs.
- There are limitations on water strategy at TPS (Wivenhoe Pipeline capacity is not sufficient to source daily requirement; salinity considerations (impacting releases); water is Stanwell's second largest generation cost.
- Concerns regarding increased access to Wivenhoe Dam for TPS (survey suggests significant additional volumes are not currently required; SEQ grid could be impacted; current and prospective agricultural, urban and industrial (including Stanwell) customers could be impacted).

## A.18 38. DNRME – Sunwater – Boyne Irrigator Meeting – 16 August 2018, Part 2

### A.18.1 Summary

Reported that there are substantive benefits to the Cooranga Weir scenario, although the impact on p/ML cost would exceed the market willingness to pay.

### A.18.2 Key Features

- Most irrigators are concerned about reliability and are interested in Cooranga Weir.
- Willingness to pay more for reliability varied among survey participants ($28-$100).
- Comparison between arrangements under current rules and the Cooranga Weir scenario (5,266ML weir; not limited by 70,000 MP cut-off; Boondooma Dam supplies Weir when water level is low).
- Benefits on Cooranga Weir scenario (reduced reliance on Boondooma Dam for MP demand; increased monthly performance at HP (+3%) and MP (+11%); decreased performance of water harvesters; decreased flows to Upper Burnett; decreased MP performance in Upper Burnett).
- Importantly, under the scenarios considered there are still significant periods where volume in Boondooma Dam is below 70,000ML and Cooranga Weir is empty.
- Cost is estimated at $25m and as the weir will provide reliability benefit to users, the cost would be added to price at an increase of approx. $200ML/a, which exceeds willingness from survey respondents.

## A.19 42. Irrigation from the Boyne River (RECE & BIEDO 2019)

### A.19.1 Summary

The study assesses the broad social and economic benefits of increased water availability in BRIA in the context of the proposed Cooranga Weir. The study determined that increasing irrigation water reliability from the current 73% to a future 88% would have a major economic impact on BRIA and the whole North Burnett Regional Council area.

### A.19.2 Key Features

- BRIA includes 30 irrigators growing a diverse range of crops. BRIA is reliant on water stored in Boondooma Dam, which provides an allocation of 29,990ML of high priority water to TPS and 9,142ML of medium priority to irrigators.
- Water reliability is a continual issue on the basis that the allocated water is insufficient to meet demand and in dry years there is minimal available water for irrigation. On average water availability meets 73% of allocations.

- BRIA has a large area of suitable soils where irrigation could expand with increased was.
- Poor water reliability has a major impact on production, on-farm decision making, cash-flow and debt management, and on the long-term future of growers.
- Improved water reliability would have positive impacts: improved efficiency; production improvements and increases to the production area; value to the regional economy.
- Increasing irrigation water reliability from the current 73% to a future 88% would have a major economic impact on BRIA and the whole North Burnett Regional Council area. The increased agricultural multiplier is 2.32.

## A.20 46. Network Service Plan – Barker Barambah Bulk Water Service Contract

### A.20.1 Summary

The NSP outlines a short-term refurbishment and longer-term projects for the improvement of the Boyne River Tarong area by Sunwater. The primary infrastructure in this NSP region is Bjelke- Petersen Dam. The significant works for the five-year forward period is focused on Silverleaf Weir and assessments and works on Bjelke-Petersen Dam.

### A.20.2 Key Features

- Water entitlement and actual usage is summarised for user types, with the biggest entitlement and usage in the region being irrigators (MP) and urban (HP).
- The NSP provides a detailed breakdown of the revenue, costs and expenditure for bulk management in region.
- Expenditure on Operations for the region is 54.32% above QCA's recommended expenditure for the period.
- Expenditure on Preventative Maintenance is 21.04% above QCA's recommended expenditure for the period.
- Expenditure on Corrective Maintenance is 28.74% above QCA's recommended expenditure for the period.
- Non-routine expenditure (not covered by the annuity) for the period 2017-18 to 2023-24 is summarised, with the highest forecast expenditure on refurbishment of Silverleaf Weir and assessments and works on Bjelke-Petersen Dam.

## A.21 47. Network Service Plan - Boyne River Tarong Bulk Water Service Contract

### A.21.1 Summary

The NSP outlines a short-term refurbishment and longer-term projects for the improvement of the Boyne River Tarong area by Sunwater. The primary infrastructure in this NSP region is Boondooma Dam. The significant works for the five-year forward period is focused on assessments and works on Boondooma Dam.

### A.21.2 Key Features

- Water entitlement and actual usage is summarised for user types, with the biggest entitlement and usage in the region being industrial customers (HP) and irrigators (MP).
- The NSP provides a detailed breakdown of the revenue, costs and expenditure for bulk management in region.
- Expenditure on Operations for the region is 159.25% above QCA's recommended expenditure for the period.
- Expenditure on Preventative Maintenance is 21.11% below QCA's recommended expenditure for the period.
- Expenditure on Corrective Maintenance is 47.46% below QCA's recommended expenditure for the period.

- Non-routine expenditure (not covered by the annuity) for the period 2017-18 to 2023-24 is summarised, with the highest forecast expenditure on assessments and works on Boondooma Dam.

## A.22 48. Network Service Plan – Three Moon Creek Bulk Water Service Contract

### A.22.1 Summary

The NSP outlines a short-term refurbishment and longer-term projects for the improvement of the Boyne River Tarong area by Sunwater. The primary infrastructure in this NSP region is Cania Dam. The significant works for the five-year forward period are focused on assessments on Cania Dam and works on various weirs.

### A.22.2 Key Features

- Water entitlement and actual usage is summarised for user types, with the biggest entitlement and usage in the region being irrigators (MP) and urban (HP).
- The NSP provides a detailed breakdown of the revenue, costs and expenditure for bulk management in region.
- Expenditure on Operations for the region is 88.44% above QCA's recommended expenditure for the period.
- Expenditure on Preventative Maintenance is in line with QCA's recommended expenditure for the period.
- Expenditure on Corrective Maintenance is 272.94% below QCA's recommended expenditure for the period.
- Non-routine expenditure (not covered by the annuity) for the period 2017-18 to 2023-24 is summarised, with the highest forecast expenditure on assessments on Cania Dam and works on various weirs.

## A.23 49-56. Water for Economic Development DSDMIP (Water Trading)

### A.23.1 Summary

While there is a relatively consistent number of water transfers and total water volume transferred (with the notable exception of 2012/13) in North and South Burnett, the actual volume transferred is low compared to the Bundaberg Water Supply Scheme or other water plan areas.

Figure A.9: Data set and visualisations (constructed from data in Documents #49-56)

| Year | Transfers | Total Volume (ML) | | |
|---|---|---|---|---|
| 2011/12 | 22 | 1,891 | | |
| 2012/13 | 10 | 29,838 | | |
| 2013/14 | 21 | 2,711 | | |
| 2014/15 | 38 | 1,990 | | |
| 2015/16 | 38 | 1,786 | | |
| 2016/17 | 19 | 2,670 | | |
| 2017/18 | 29 | 1,737 | | |
| 2018/19 | 23 | 1,293 | | 2,941 |

## A.24 57. Sustainable Water Alternatives for the Southern Burnett

### A.24.1 Summary

Review of the relevant reports and studies on the water alternatives in the Kingaroy, Nanango, Rosalie and Crows Nest LGAs, and recommendations for implementing water strategies.

### A.24.2 Key Features

- The paper considers and analysis 18 proposals/strategies for the management of water resources in Southern Burnett, including the formation of a specific group with the power to purchase and distribute water allocations; new approaches to water trading; the conversion between high and medium water allocations; and the construction of new infrastructure.
- The proposals/strategies are ranked using multiple methodology, including estimated cost, a weighted scoring system that considers multiple factors, and local knowledge and expertise. The options are outlined in the Figure 3.13 and key information is provided in relation to available water volumes, reliability, location, costs and beneficiaries.
- The paper provides a detailed description of how to proceed with the ongoing review and assessment of the selected option(s), and the management of, and advocacy for, water interests in the region.

Figure A.10: Alternative Options in Southern Burnett

**TABLE A.1 Alternatives**

| Ref. Number | Improvement Opportunity | Volume Available (ML/yr) | Reliability | Source | Potential offtake location | Time to Implement | Estimated Capital Cost per ML | Estimated Operational Cost per ML | Potential Benefactors | Comments | Actions |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.1.A(i) | Unassigned supplemented water Silverleaf weir | 700 | 85-90% | Silverleaf Weir on Barambah Creek | From backup of Bjelke Peterson Dam to Stonelands | 6-12 months | $1,000 | $50 | Kingaroy, Nanango Murgon Shires | Costs for water purchase and supply to pump offtakes only | Negotiate with Sunwater. |
| 3.1.A(ii) | Unassigned supplemented water Tarong Pipeline | 91 | > 95% | Tarong Pipeline | Tarong Pipeline | 6-12 months | > $1,000 | > $100 | Kingaroy Shire | Costs for water purchase and supply to pump offtakes only | Negotiate with Sunwater. |
| 3.1.A(iii) | Unassigned supplemented water Barlil weir | 4250 | 85-90% | Barlil Weir on Barambah Creek | From backup of Bjelke Peterson Dam to Stonelands | 2 years | > $1000 | $50 | Kingaroy, Nanango Murgon Shires | Costs for water purchase and supply to pump offtakes only | Lobby Government for allocation to be set aside for Local Government |
| 3.1.A(iv) | Unassigned supplemented water Paradise Dam | | | | | | | | | Not considered | |
| 3.1.A(v) | Unassigned supplemented water Wivenhoe pipeline | 2500 | > 95% | Wivenhoe pipeline | Wivenhoe pipeline | 2 years | > $1000 | > $300 | Kingaroy, Nanango Murgon, Rosalie, Shires and Tarong Energy | Costs for water purchase and supply to pump offtakes only | Negotiations necessary with Brisbane Water and Tarong Energy |

| Ref. Number | Improvement Opportunity | Volume Available (ML/yr) | Reliability | Source | Potential offtake location | Time to Implement | Estimated Capital Cost per ML | Estimated Operational Cost per ML | Potential Benefactors | Comments | Actions |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.1.B(i) | Supplemented water allocations, Owned by Irrigators | 30000 | 85-90% | Barker Barambah Water Supply Scheme | From backup of Bjelke Peterson Dam to Stonelands | 6-12 months | $500-$1000 | $50 | Kingaroy, Nanango and Murgon Shires and Tarong Energy | Costs for water purchase and supply to pump offtakes only | Allocate funds to purchase water title.<br>Establish suitable agreements for leasing water to third parties |
| 3.1.B(ii) | Supplemented water allocations Owned by Shires | 1800 | | | | | | | | Unlikely that Shires would sell water. Not considered further | |
| 3.1.C | Unsupplemented Water | 34200 | 70-90% | Barker Barambah Stuart and Boyne Rivers | Barker Barambah Stuart and Boyne Rivers | 6-12 months | $100 | | All group users, depending upon location | This is a combination of unsupplemented water and water harvesting. Costs for water purchase and supply to pump offtakes only | Investigation into individual or joint facilities for extraction points.<br>Allocate funds to purchase water title |

| Ref. Number | Improvement Opportunity | Volume Available (ML/yr) | Reliability | Source | Potential offtake location | Time to Implement | Estimated Capital Cost per ML | Estimated Operational Cost per ML | Potential Benefactors | Comments | Actions |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.2.A | Groundwater Subartesian water | For protection of current extraction | | Groundwater Alluvials | | 6-12 months | | | Shires using groundwater extraction | Primarily for protection of current users | ROP submission to request groundwater inclusion in the WRP/ROPs |
| 3.2.B | Groundwater Artesian water | Unknown | | | | 2-5 years | | | | | Commission research of mineral logs to determine potential. |
| 3.3.A | Wastewater/Effluent Reuse Councils | 500 | >95% | Various point sources | | 6 months | < $500 | < $50 | Kingaroy, Nanango Murgon Shires | | Design contracts for end users of this resource with 3-5 year renewal period |
| 3.3.B | Wastewater/Effluent Reuse Tarong | Variable | | Tarong PowerStation | Tarong outlet to Bjelke Petersen Dam | 2 years | | | Kingaroy, Nanango Murgon, Shires and Tarong Energy | Currently used by irrigators D/S from Tarong | Design contracts for end users of this resource with 3-5 year renewal period |
| 3.3.C | Wastewater/Effluent Reuse External Sources | 50000 | >95% | Sunshine Coast | To be constructed pipeline | 10 years | >$4000 | $200 | All group users, depending upon location | | Ensure the proposal is on the agenda of the SEQRWSS |

| Ref. Number | Improvement Opportunity | Volume Available (ML/yr) | Reliability | Source | Potential offtake location | Time to Implement | Estimated Capital Cost per ML | Estimated Operational Cost per ML | Potential Benefactors | Comments | Actions |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.4 | Desalination | Unknown | | | | 5 years | >$5000 | >$250 | All group users, depending upon location | Technology improving and costs decreasing. Identification of a feedstock is essential. | Ensure the proposal is on the agenda of the SEQRWSS |
| 3.5 | Redundant weirs | To be negotiated | 70-90% | Proston and Nanango weirs | | 1-2 years | | | Kingaroy and Nanango Shires, Tarong Energy | Could be used to store purchased or granted water allocations | Design yields require investigation. Discuss options with DNRM&E |
| 3.6.A | New Water Infrastructure Brisbane Valley infrastructure | 30000 | 85-95% | Emu or Cooyar Creeks | Duplicated Wivenhoe pipeline | 10 years | $2000-$3000 | >$300 | All group users, depending upon location | Dependant upon WRPs and demand | Ensure the proposal is on the agenda of the SEQRWSS |
| 3.6.B | New Water Infrastructure Barker/Barambah/Stuart infrastructure | 1500 | >95% | Gordonbrook Dam | Gordonbrook Dam | 5 years | $5,500 | | Kingaroy Shire | Necessary to purchase the allocation to obtain the water for the dam | Factor into cost comparisons the fact that the distribution system is in place |
| 3.6.C | New Water Infrastructure Wivenhoe pipeline upgrades | 15000 | >90% | Wivenhoe | Duplicated Wivenhoe pipeline | 2-5years | >$3000 | >$300 | All group users, depending upon location | Requires allocation thru the Moreton WRP | Ensure the proposal is on the agenda of the SEQRWSS |

## A.25 58. Kingaroy Water Supply: Augmentation of Raw Water Supply

### A.25.1 Summary

The report was commissioned to investigate new water sources for Kingaroy and expanded treatment plant capacity. The report identified and analysed multiple options and recommended further action.

### A.25.2 Key Features

- The report considered five primary options for the augmentation of the Kingaroy water source: raise Gordonbrook Dam; connect the Boondooma-Tarong Pipeline; bore water supplies; construct a new dam; and construct a pipeline from the Bjelke-Peterson Dam.

- Each of the options is analysed and assessed as a mechanism for providing greater water volume and reliability for Kingaroy. The report concludes that the raising of Gordonbrook Dam by 4.1m would be the most economical way to provide additional raw water, although other investigations should be conducted.
- The Report recommends that further investigations be conducted into bore water supplies at specific locations, although it is noted that bore water supply alone is unlikely to satisfy the forward demand projections.
- The Report recommends further investigation and comparison of the options outlined in the report, and community consultation to identify the quality of water desired with consideration to softening of the Gordonbrook Dam supply.

## A.26 59. Kingaroy Water Supply Planning Report – Development of Borefield

### A.26.1 Summary

Investigation of the development of a borefield south of Kingaroy to supplement existing supply from Gordonbrook Dam and delay the second raising of Gordonbrook Dam.

### A.26.2 Key Features

- This Report was commissioned by KSC following the preparation of Kingaroy Water Supply: Augmentation of Raw Water Supply (see Document #58) to investigate to recommended borefield options.
- The report concluded that the substantial cost of the development of the borefield ($2.5m in 1995) would be justified by the 11-year deferment of the raising of Gordonbrook Dam.
- The report recommended that experienced consultants assess and identify the viability of suitable bores in the area.

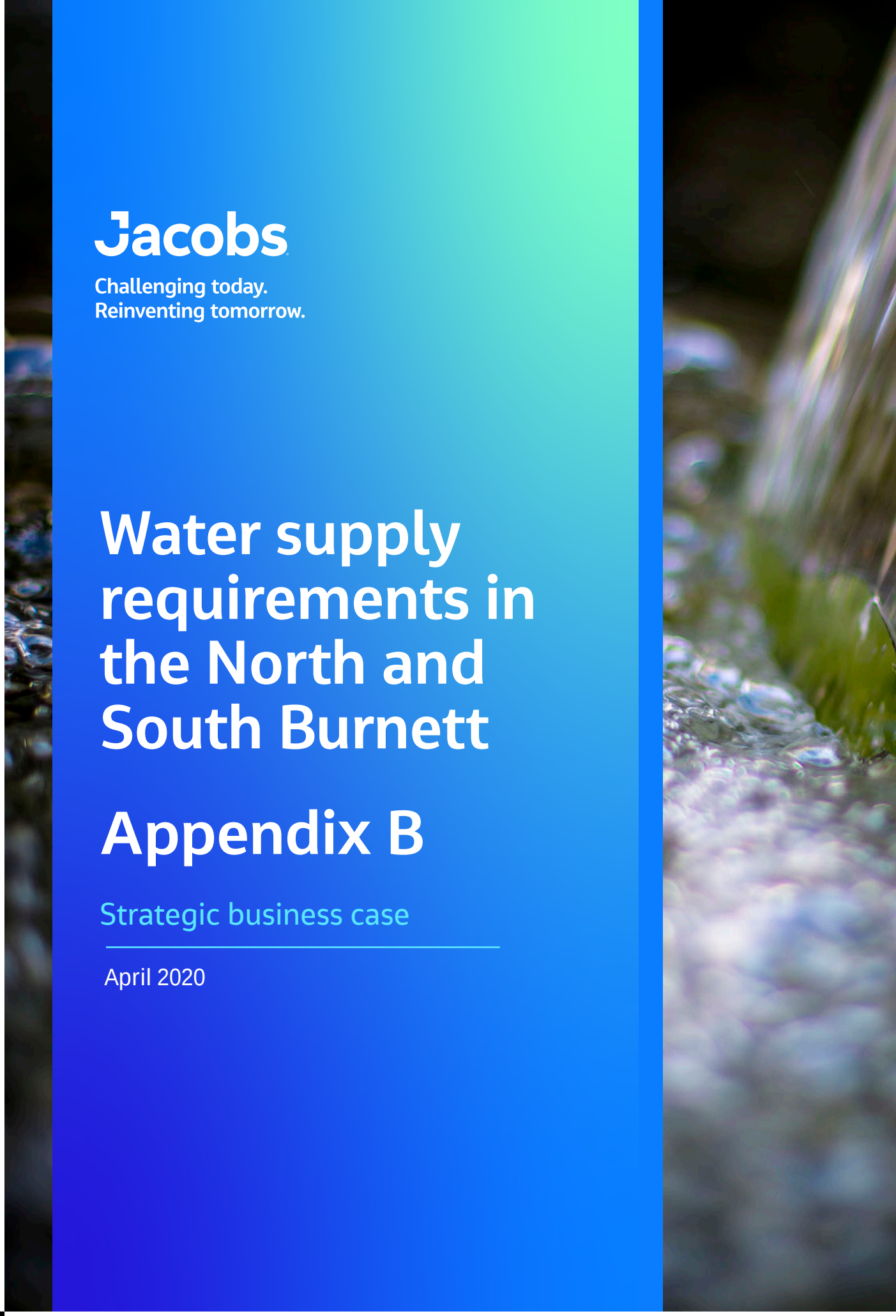
## A.27 60. Nanango Water Supply: Augmentation of Barker Creek Groundwater Supply

### A.27.1 Summary

Report on the program of bore hole investigations to identify viable options for additional supply of bore water in the NSC area.

### A.27.2 Key Features

- Assessment of the performance and viability of twelve bore holes drilled into the Barker Creek alluvium.
- None of the twelve bore holes indicated viability of potential supply equivalent to the yield from the existing bore holes drilled in 1982.
- Production hole 13 was drilled and provides a viable option for bore water supply, subject to treatment in a manganese greensand filer.
- Report recommends upgrading the existing bore holes and the most effective and economically viable option.



Jacobs

Challenging today.
Reinventing tomorrow.

# Water supply requirements in the North and South Burnett

# Appendix B

## Strategic business case

April 2020

badu advisory
water + environment

# Jacobs

## Feasibility Study of water supply requirements in North Burnett and South Burnett: Strategic water advice

24 March 2020

Badu Advisory Pty Ltd

ABN 17613 863 602

Post: PO Box 2051

Keperra, QLD, 4054

AUSTRALIA

Email: info@baduadvisory.com

Web: www.baduadvisory.com

## Key points

Badu Advisory was engaged by Jacobs to provide strategic advice to Jacobs in relation to:

- the water planning requirements, provisions, constraints and opportunities relating to the feasibility study of water supply requirements and water security options in the North Burnett and the South Burnett
- the potential water products (e.g. hydrologic performance) for the areas.

The water plan for the Burnett Basin provides for unallocated water reserves as follows:

- a total of 25,845ML of nominal volumes of supplemented water available in the strategic water infrastructure reserve made up of:
  - up to 4,250 ML for water infrastructure on Barker Barambah Creek within the Barker Barambah Water Supply Scheme
  - up to 15,295 ML for water infrastructure on the Burnett River within the Bundaberg water supply scheme
  - up to 6,300 ML for water infrastructure on the Burnett River within the Upper Burnett water supply scheme.
- A total of 2,000ML of nominal entitlement as a strategic reserve made up of:
  - 1,000 ML of water licences for projects of State significance
  - 1,000 ML of water licences for an indigenous purpose.
- A total of 2,000 ML of nominal entitlement as a general reserve for any purpose made up of:
  - 1,000 ML of water licences in the Gregory River sub-catchment
  - 1,000 ML of water licences in the Isis River sub-catchment.

In addition, there are approximately 10,469 ML of medium priority water allocation (held by Burnett Water) in the Upper Burnett Water Supply Scheme are currently unused and not able to access, or be supplied from, the water announced as being available in the scheme. This is relates to the loss of storage volumes arising from the decommissioning of the fabridam at Claude Wharton Weir. Should the storage volume in the system be reinstated in the future (through, for example, the construction of a new gated structure to replace the decommissioned fabridam), it is expected that these water allocations would be reinstated again.

A further potential opportunity for the north and south Burnett may arise from unutilised and/or un-utilisable water allocations becoming available from Paradise Dam as a result of the lowering of the dam wall as an outcome of the ongoing Paradise Dam Improvement Program.

Water users appear to be justified in their concerns that monthly reliabilities of medium priority water allocations in the north and south Burnett are not adequate for the types of crops that are increasingly being grown there. For example, using water allocation security objectives as a measure, the monthly reliabilities for Barker-Barambah, Boyne River / Tarong and Three Moon Creek water supply schemes are reportedly just 75%, 70% and 65% respectively.

Improving water supply security to support the expansion of irrigated agriculture in the Burnett Basin might be achieved by a combination of improving the monthly reliabilities of groups of existing medium priority water allocations plus creating volumes of additional (new) water allocations. The report lists a number of ways that this might be achieved including constructing new (or augmenting existing) water infrastructure, reforming existing water sharing rules, as well as freeing up trading arrangements within and between existing water supply schemes.

## Table of Contents

# 1 Introduction

## 1.1 Context

Jacobs was engaged by the Department of Natural Resources, Mines and Energy (DNRME) to undertake a feasibility study of water supply requirements and water security options in the North Burnett and the South Burnett. The purpose of the study was to identify a range of water supply options which may be able to increase water supply security to support expansion of irrigated agriculture and deliver strong economic benefits, while protecting the environment[1].

## 1.2 Purpose of this report

Badu Advisory was engaged by Jacobs to provide strategic advice (in the form of this report) to Jacobs in relation to:

- the water planning requirements, provisions, constraints and opportunities relating to the feasibility study
- the potential water products (e.g. hydrologic performance) for the study areas.

## 1.3 Methodology

This report has been prepared based on:

- Badu Advisory's evaluation of the current water planning arrangements including a review of water planning documents and other historical information (from a water plan and water product/hydrologic performance perspective) and
- discussions with DNRME officers at the commencement of the project
- discussions with stakeholders during a field trip in November 2019
- ongoing liaison and collaboration with members of the Jacobs team.

# 2 Water planning provisions

## 2.1 Queensland's water planning framework

An overview of water planning framework is presented in Appendix A including about:

- Queensland's Water Act 2000 ('the Act')
- water allocations
- water plans
- water management protocols and operations manuals
- operations licences.

[1] From *Statement of Work Request (SOWR): DNRME19025 for the procurement of Consultant for Feasibility Study of water supply requirements in North Burnett and South Burnett*, Department of Natural Resources, Mines and Energy, 2019

## 2.2 The Burnett Basin water plan

Water in the Burnett River basin is allocated and managed under the Water Plan (Burnett Basin) 2014 (the 'water plan'). Figure 1 shows the plan area for the water plan.

*Figure 1 – Water plan area*


*Replicated from the water plan area map presented on Business Queensland website*

The plan was last replaced in 2014 and is due to expire on 1 September 2024. A five-year assessment of the water plan was completed in 2019 which identified a number of emerging issues[2] including:

- the interest in accommodating potential new water infrastructure developments within the plan area to address agricultural water demands and water security including Cooranga weir, Claude Wharton Weir (where a bag was decommissioned) as well as NWIDF projects including Gayndah regional infrastructure development (GRID)
- the implications of progressing the Paradise Dam Improvement Program with Building Queensland commencing an expedited assessment of options and reporting back to Government early in 2020. It is understood that Sunwater are also preparing to commence lowering the spillway as soon as the 2019/2020 wet season is over.
- the implications of long-term climate change projections for 2030 which predict an increase in evaporation across the plan area as well as a small decrease in rainfall mainly during the spring months and a small increase in rainfall mainly during the autumn months.

## 2.3 Existing water entitlements

Existing water entitlements in the plan area consist of supplemented water allocations, supplemented interim water allocations, unsupplemented water allocations and water licences. A summary of the total existing water entitlements within plan area is presented in Table 1.

*Table 1 - Summary of existing water entitlements in the Burnett Basin*

| Entitlement Type | Entitlement numbers | | | | Entitlement | |
|---|---|---|---|---|---|---|
| | All | Volumetric | Area | Other[T] | Volume (ML) | Area (ha) |
| Surface Water Licences* | 775 | 184 | 352 | 239* | 25467 | 5098 |
| Underground water Licences | 270 | 259 | 0 | 11^ | 35274 | 0 |
| Supplemented Surface Water Allocations | 4633 | 4633 | 0 | 0 | 493848 | 0 |
| Unsupplemented Surface Water Allocations | 439 | 439 | 0 | 0 | 48344 | 0 |
| Unsupplemented Underground Water Allocations | 758 | 758 | 0 | 0 | 62326 | 0 |
| Interim Water Allocation | 127 | 127 | 0 | 0 | 14586 | 0 |

[T] Entitlement is not stated, *Includes all licences to interfere, ^Dewatering licences.

*Replicated from Appendix B, Table 7 of Minister's Performance Assessment Report of the Water Plan (Burnett Basin) 2014*

Figure 2 presents a map of the sub-catchment areas and water supply schemes in the Burnett Basin water plan area. The supplemented water allocations in the table above are located in water supply schemes within the Burnett River, Boyne River and Barambah Creek, and Bundaberg water supply schemes whilst the supplemented interim water allocations are located in the Three Moon Creek water supply scheme[3].

[2] *Minister's Performance Assessment Report of the Water Plan (Burnett Basin) 2014*, Water Policy and Water Services (South Region), DNRME, 2019

[3] The Thee Moon creek water supply scheme currently operates under an Interim Resource Operations Licence (IROL). A water plan amendment is required to convert the interim water allocations to tradable water allocations.

*Figure 2 - Sub-catchment areas and water supply schemes in the Burnett Basin*


*Adapted from Figure 1 of Minister's Performance Assessment Report of the Water Plan (Burnett Basin) 2014 (Nov 19)*

## 2.4 Announced allocations

Announced allocation provisions apply to water allocations in all of the supplemented water supply schemes in the plan area.

Medium priority and high priority announced allocations can vary from year to year and from scheme to scheme and are generally based on the volumes of water held in storages (dams and weirs) within each scheme.

Announced allocations for all high priority water has been set at 100 per cent in all schemes at the commencement of each water year since the plan was updated in 2014.

The Three Moon Creek water supply scheme is primarily an underground water recharge scheme where releases are made from Cania Dam to recharge the surrounding benefitted alluvial aquifer via a series of weirs along Three Moon Creek. The announced allocations for surface water and underground water are determined based on storage levels in Cania Dam and water levels in monitoring bores within the scheme area. Surface water (water flowing or ponded in Three Moon Creek) is available from time to time. Surface water customers can take their allocation when water is available in the creek[4].

## 2.5 Unallocated water

Section 36 of the water plan provides for strategic water infrastructure reserves, strategic reserves and general unallocated water reserves in the Burnett Basin as follows:

- There is 25,845ML of nominal volumes of supplemented water available in the strategic water infrastructure reserve made up of:
  - up to 4,250 ML for water infrastructure on Barker Barambah Creek within the boundaries of the Barker Barambah water supply scheme
  - up to 15,295 ML for water infrastructure on the Burnett River within the boundaries of the Bundaberg water supply scheme
  - up to 6,300 ML for water infrastructure on the Burnett River within the boundaries of the Upper Burnett water supply scheme.
- The plan also reserves 2,000ML of nominal entitlement as a strategic reserve made up of:
  - 1,000 ML of water licences for projects of State significance
  - 1,000 ML of water licences for an indigenous purpose.
- The plan makes available 2,000 ML of nominal entitlement as a general reserve for any purpose made up of:
  - 1,000 ML of water licences in the Gregory River sub-catchment
  - 1,000 ML of water licences in the Isis River sub-catchment.

The total volume of water that may be allocated in the Burnett Basin is effectively capped. This means that apart from the additional volumes of unallocated water reserves above or reconfiguring and/or trading existing water entitlements, the plan prohibits any decisions relating to surface water or groundwater entitlements that would have the effect of increasing the total average volume of water available to be taken in the plan area.

[4] See *Water Supply Arrangements and Service Targets: Three Moon Creek Water Supply Scheme*, SunWater https://www.sunwater.com.au/wp-content/uploads/Home/Schemes/Three-Moon-Creek/Three_Moon_Creek_Rules_Targets.pdf

## 2.6 Process for granting unallocated water

The water plan states that the process for releasing unallocated water in the plan area must be as prescribed in the part 2, division 2, subdivision 2 of the Water Regulation 2016, i.e. by:

- public auction
- tender
- fixed price sale
- grant for a particular purpose.

The Minister's November 2019 review report affirmed that the water plan outcomes, together with the Water Regulation, aim to provide a framework for the fair and transparent release of the reserved water.

## 2.7 Claude Wharton Weir

Section 63 of the water plan provided for specific volumes of medium priority water allocations that are held by Burnett Water Pty Ltd to be changed to low priority water allocations if and when the water sharing rules in the ROP for the Upper Burnett Water Supply Scheme ROP were amended post the commencement of the water plan. This was as a result of SunWater's decision to deflate and decommission the Claude Wharton fabridam in November 2008 following the failure of a similar inflatable structure at Bedford Weir.

The water sharing rules for the Upper Burnett Water Supply Scheme were originally set out in an appendix to the water plan rather than the ROP. This meant that the ROP was never actually amended to include water sharing rules for the Upper Burnett Water Supply Scheme resulting in Section 63 of the water plan never being triggered. Recently, these water sharing rules have been incorporated into the Operations Manual for the scheme, again not triggering Section 63.

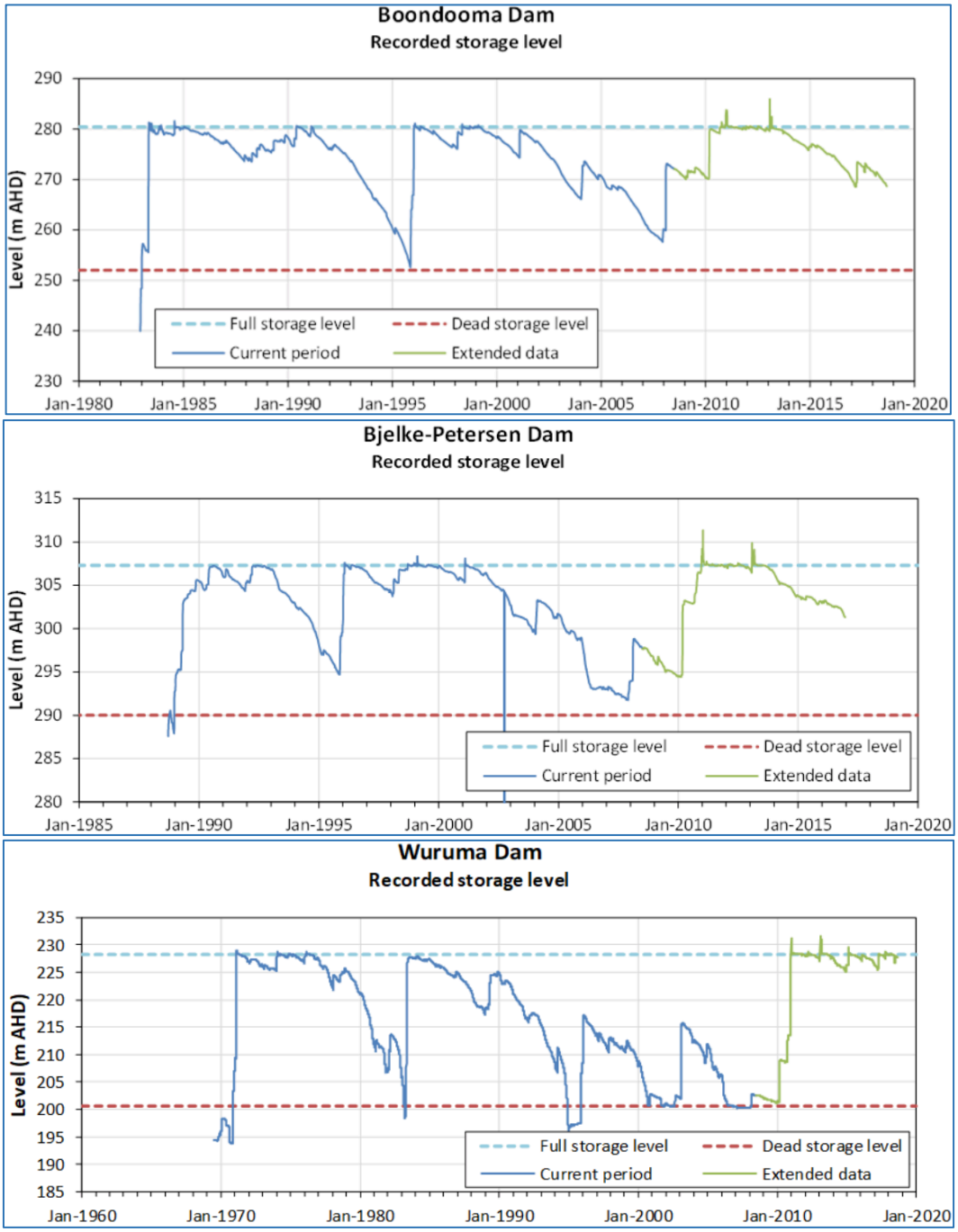
The water sharing rules have been designed to exclude 10,469 ML of medium priority water allocations. In effect, this means that 10,469 ML of medium priority water (held by Burnett Water) in the Upper Burnett Water Supply Scheme are unused and not able to access, or be supplied from, the water announced as being available in the scheme. Should the storage volume in the system be reinstated (through, for example, the construction of a new gated structure to replace the decommissioned fabridam), it is expected that these water allocations would be reinstated again.

# 3 Water product considerations

## 3.1 Historical dam storage performance

Water level data for Boondooma Dam, Bjelke-Petersen Dam and Wuruma Dam are presented in Figure 3 below.

*Figure 3 - Dam storage levels*




*From Minister's Performance Assessment Report of the Water Plan (Burnett Basin) 2014 (Nov 19)*

These illustrate that there have been significant periods over history that storage levels have been at or near dead storage level and that the timing of these periods tend to be correlated (e.g. 1996, 2009).

In the Boyne River and Tarong water supply scheme, releases are made from Boondooma Dam to meet demands for medium priority water allocation holders downstream of the dam only if the storage level is above 268.67m Australian Height Datum (AHD) which equates to approximately 70,000ML in storage capacity. No releases may be made below this to protect high priority water allocations for town water supplies and power generation. This rule has been in place since Boondooma Dam was built and was enacted in 2017-18 and 2018-19 water years.

## 3.2 Water allocation security objectives

The water plan specifies water allocation security objectives (WASOs) for high, medium and low priority groups of supplemented water allocations.

Section 21 of the water plan states that the WASO performance indicator for taking supplemented surface water is the monthly supplemented water sharing index. This is defined by the water plan to be the percentage of months in the IQQM simulation period in which a particular group of supplemented water allocations are fully supplied.

Table 2 presents the volumes and WASOs for each priority group of supplemented water allocations in the Burnett Basin.

*Table 2 - Supplemented water allocations and associated performance objectives*

| Scheme | Major scheme storage | High priority nominal volume (ML) | Medium priority nominal volume (ML) | Medium priority nominal volume excluded from water sharing rules (ML) | High priority WASO | Medium priority WASO | Medium priority WASO (groundwater) | Comments |
|---|---|---|---|---|---|---|---|---|
| Boyne River and Tarong | Boondooma Dam | 33920 | 9485 | | 95% | 70% | | HP volume may become available if/when Tarong PSS closes in ~2039.<br>Cut-off rule impacts MP performance |
| Barker Barambah | Bjelke-Petersen Dam | 2236 | 32079 | | 99% | 75% | | |
| Bundaberg - Burnett Water | **Burnett**: Paradise Dam, Ned Churchward Weir, Ben Anderson Barrage, **Kolan**: Fred Haigh Dam, Bucca Weir and Kolan Barrage | 20000 | 124000 | | 99% | 90% | | Lowering of Paradise Dam may lead to additional unallocated water being available for reassignment elsewhere in the Burnett Basin (to underpin new development) |
| Bundaberg - SunWater | | 24372 | 211957 | | | | | |
| Upper Burnett - Burnett Water | Wuruma Dam, Kirar Weir, Jones Weir and Claude Wharton Weir | 0 | 9531 | 10469 | 99% | 85% | | 10,469 ML of medium priority water allcoations in the Upper Burnett Water Supply Scheme are unused and not able to access, or be supplied from, the water announced as being available in the scheme. |
| Upper Burnett - SunWater | | 1530 | 25460 | | | | | |
| Three Moon Creek | Cania Dam | 380 | 14961 | | 95% | 65% | 80% | Includes supplemented groundwater |

Using WASOs as a measure of hydrologic performance, the table illustrates that the monthly reliabilities of medium priority water allocations in the Barker-Barambah, Boyne River / Tarong and Three Moon Creek water supply schemes are just 75%, 70% and 65% respectively. By state standards, this might be considered to be relatively low for medium priority water products particularly where alternative water supply sources (e.g. groundwater) are limited.

## 3.3 Headworks utilisation

Headworks Utilisation Factors (HUFs) describe the percentage of a WSS's storage headworks volumetric capacity that is effectively utilised by each priority group of water entitlements in that scheme during critically low periods. This factor is a key consideration in, and input to, the allocation of the relevant capital costs (i.e. asset value and renewal costs) associated with a scheme's bulk water assets. It is also a useful descriptor of the extent to which headworks storage supports the performance of medium priority water allocations relative to high priority water allocations.

Table 3 presents the HUFs[5], water allocation volumes[6] and other parameters for the water supply schemes in the north and south areas of the Burnett Basin.

*Table 3 - Headworks utilisation factors*

| Scheme | Major scheme storage | Useable volume (ML) | High priority nominal volume (ML) | Medium priority nominal volume (ML) | Proportion of total nominal volume that is medium priority (%) | Medium priority HUF (%) |
|---|---|---|---|---|---|---|
| Boyne River and Tarong | Boondooma Dam | 195840 | 33920 | 9485 | 22% | 4% |
| Barker Barambah | Bjelke-Petersen Dam | 135068 | 2236 | 32079 | 93% | 72% |
| Upper Burnett - Burnett Water | Wuruma Dam, Kirar Weir, Jones Weir and Claude Wharton Weir | 184159 | 0 | 9531 | 48% | 100% |
| Upper Burnett - SunWater | | | 1530 | 25460 | 94% | 64% |
| Three Moon Creek | Cania Dam | 87850 | 380 | 14961 | 98% | 61% |

The table particularly illustrates that in the Boyne River and Tarong water supply scheme, the proportion of headworks storage being utilised by medium priority water allocations in critically low periods is very low (just 4%) even though medium priority water allocations represent 22% of the total nominal volume in that scheme. This is due to the operation of the announced allocation coupled with the cut-off rule in that system (as described in Section 3.1).

## 3.4 Opportunities for improvement

Improving water supply security to support expansion of irrigated agriculture in the Burnett Basin might be achieved by a combination of:

A. Improving product performance: Improving the monthly reliabilities of groups of existing medium priority water allocations in the basin by, for example:

   1. Reforming the water sharing rules in Boondooma Dam to remove, or mitigate, the effects from the cut-off rule
   2. Reinstating Claude Wharton Weir's full water storage volume and restoring access to the full volume of medium priority water allocations
   3. Reforming schemes' water sharing rules (e.g. by moving from announced allocations to continuous sharing) to allow greater flexibility and choice in allowing water users to select their desired long-term reliability

[5] Refer to Irrigation Price Review Submission, Appendix J: Headworks Utilisation Factors Technical Paper, SUnWater, 6 November 2018, accessed from QCA website: (https://www.qca.org.au/project/rural-water/irrigation-price-investigations/)

[6] Note that the medium priority nominal volume used to calculate the HUFs in the Upper Burnett Water Supply Scheme excludes the 10,469ML of medium priority water that is excluded from the water sharing rules.

4. Freeing up permanent and/or temporary trading of water allocations within and between water supply schemes
5. Optimising in-scheme unsupplemented access rules to cater for greater use of projected water levels when making water harvesting announcements
6. Constructing re-regulating weirs downstream of existing headworks storages
7. Raising headworks storages

B. Creating additional water product: Increasing the volume of water allocations available for water users within the basin by, for example:

1. Constructing new, or raising existing, weirs
2. Constructing new, or raising existing, headworks storages
3. Freeing up high priority water allocations from Boondooma Dam through greater utilization of the Wivenhoe to Tarong Pipeline for power generation purposes
4. Constructing pipelines to enable unutilized water allocations to be accessed by existing and new water users in the north and south Burnett

# Appendix A – Overview of Queensland's water planning framework

## The Water Act 2000

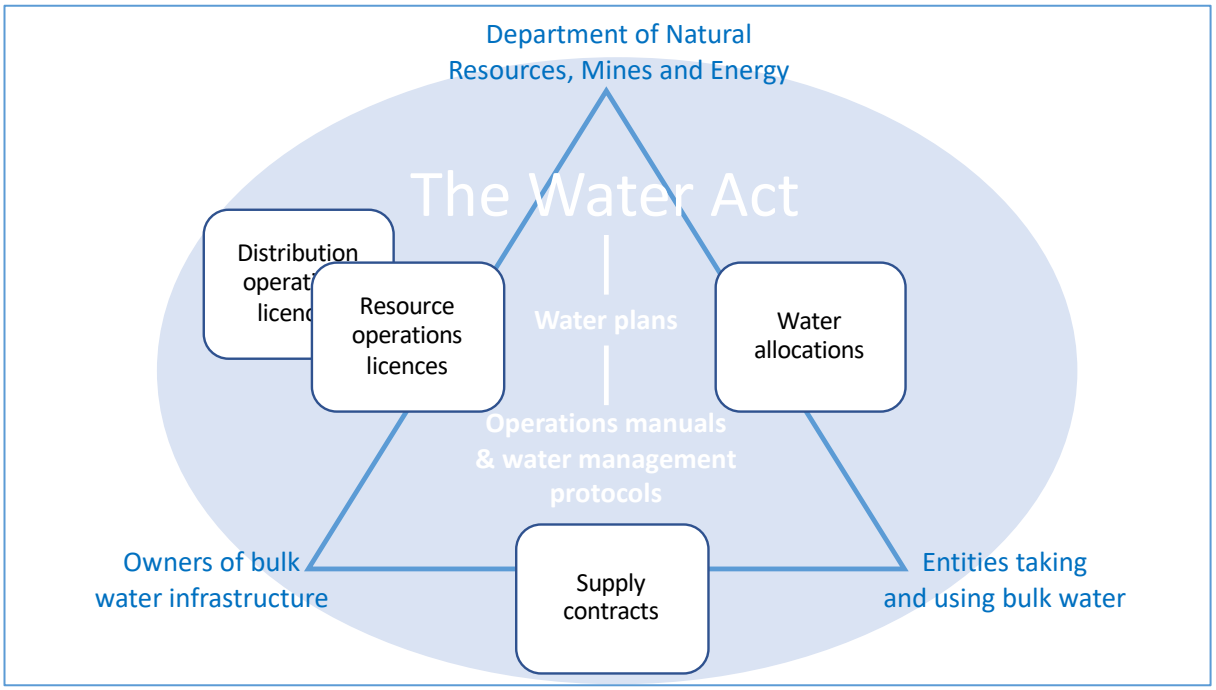
The Water Act 2000 ('the Water Act') establishes the legislative framework for planning the sustainable allocation and management of Queensland's water resources. The framework consists of:

- water plans (formerly referred to as water resource plans)
- water management protocols and operations manuals (which are progressively replacing resource operations plans)
- resource operations licences and distribution operations licences

The Water Act requires that all decisions about water allocation and management are consistent with this framework.

Figure 1 illustrates the relationships between key components of the framework that are described below.

*Figure 4: Queensland's bulk water allocation framework*




## Water allocations

The framework establishes water allocations which grant holders authorities to take water. Water allocations are separate from land, tradeable, perpetual in tenure and subject to the requirements of the above framework.

"Supplemented water" refers to water that is supplied under a resource operations licence. A resource operations licence is required to allow the owner of water infrastructure to interfere with the flow of water in a watercourse. Supplemented water allocations are specified in terms of:

- a nominal volume
- the location from which water may be taken (generally described in terms of zones)

- the purpose for which water may be taken
- the water plan and operations manual under which it is managed
- the priority group to which it belongs
- other conditions or matters

Unsupplemented water allocations are not supplied under a resource operations licence (and generally not associated with major instream water infrastructure located in a watercourse). Examples include overland flow, water harvesting (i.e. which allow the taking of water during periods of high flow) and other opportunistic entitlements (e.g. that allow taking of water from natural instream water holes).

## Water plans

Water plans define the long-term availability of water for different purposes including environmental and consumptive water uses. Water plans include:

- outcomes or aspirational targets that represent what government and the community want to achieve over time
- strategies and requirements to guide the management of environmental flows
- environmental flow objectives, water allocation security objectives and associated performance indicators to be considered when making water allocation and management decisions
- strategies that specify the groups, types and volumes of water allocations (authorities to take water) that may exist within the plan area
- strategic, general and indigenous water reserves that establish volumes, locations and allowable uses of unallocated water available in the plan area and which may be issued as new water allocations.

## Water management protocols and operations manuals

Water management protocols generally includes specific rules and requirements in order to achieve the outcomes stated in the water plan. A protocol is developed by DNRME and approved by its chief executive.

Key matters included within a water management protocol include:

- (where applicable) the processes for releasing specified water volumes of unallocated unsupplemented water for stated purposes and locations
- water sharing rules for unsupplemented water in order to provide equitable sharing of water between water users
- permanent water trading rules and seasonal (temporary) water assignment rules for unsupplemented water allocations
- permanent water trading rules water assignment rules for supplemented water allocations
- other water dealing rules..

An operations manual is prepared under the Water Act where required as a condition of a resource operations licence or distribution operations licence. A manual is developed by the operator of a scheme in consultation with stakeholders but must be approved by the chief executive of DNRME. It includes the day to day operation rules for supplemented water schemes such as:

- water releases from dams to ensure that infrastructure is operated efficiently providing flows for industry, agriculture and town water supply
- water sharing rules for supplemented water in order to provide equitable sharing of water between water users supplied by the scheme
- seasonal (temporary) water assignment rules for supplemented water allocations.

## Operations licences

A distribution operations licence or a resource operations licence allows a holder to take, or interfere with the flow of, water to distribute it to water allocation holders (typically through systems of channels or pipelines)[7]. The owner of an instream dam or weir is therefore likely to require a resource operations licence [8]. Depending on the institutional, operational and supply arrangements that are adopted, there may also be a requirement for a distribution operations licence[9].

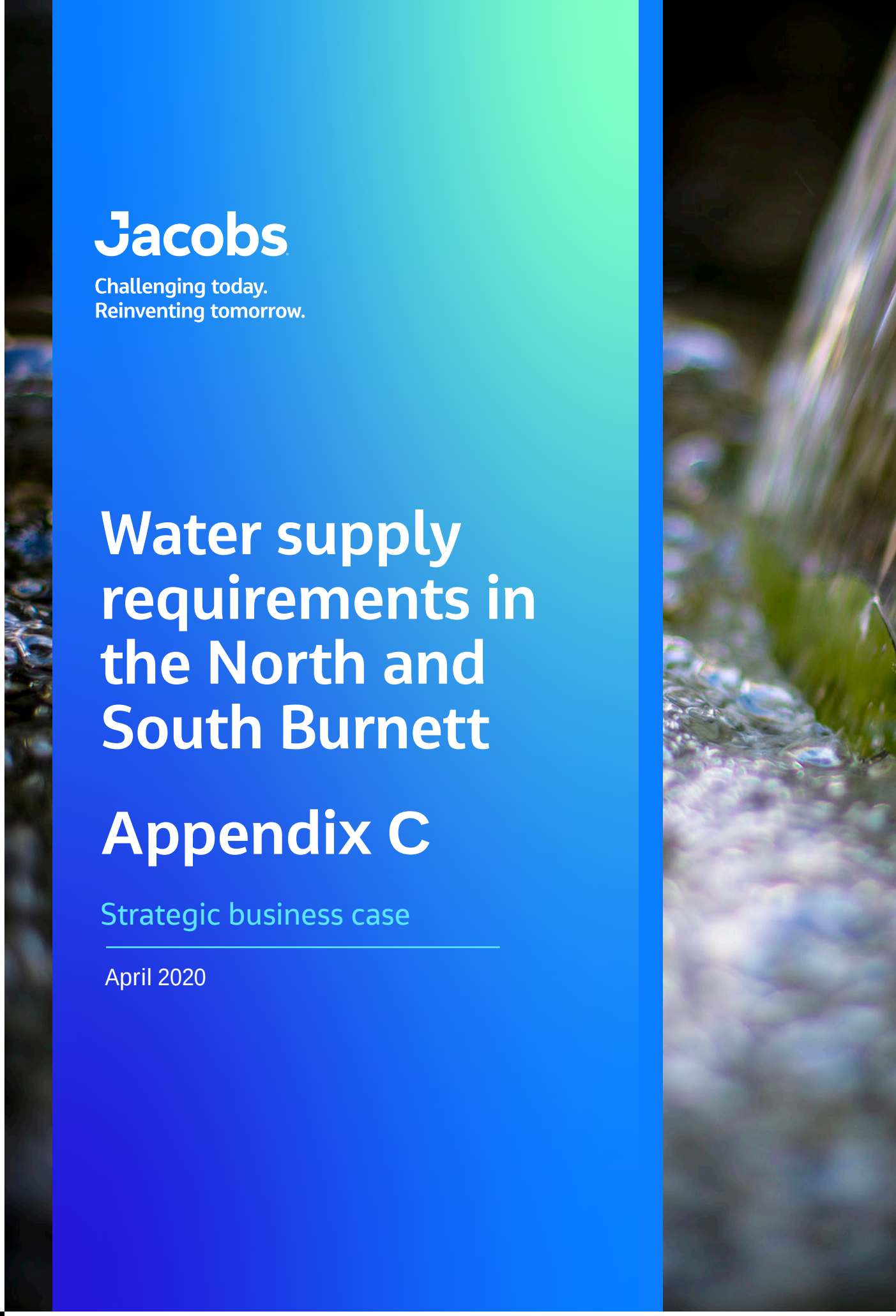
An operations licence typically includes conditions related to operating arrangements and water supply requirements. A licence holder is also required to comply with the provisions of the relevant water plan and operations manual.

In the case of a supplemented water allocation (i.e. one managed under a resource operations licence), the Water Act 2000 requires there to be a water supply contract between the resource operations licence holder and the holder of the water allocation. A supply contract sets out the arrangements by which water is to be stored and supplied as well as the financial obligations.

[7] A resource operations licence also allows a holder to interfere with the flow of water to construct and operate water infrastructure (typically dams and weirs).

[8] A resource operations licence may only be held by owner of the water infrastructure (to which the licence relates) or the owner's parent company. A distribution operations licence, however, may be held by owner of the water infrastructure (to which the licence relates), the owner's parent company or by an entity nominated by the owner.

[9] If the owner of a distribution network (e.g. pipeline or channel) was a different entity to (and not a subsidiary of) the owner of the dam, and water allocations were to be supplied via that distribution network, then the distribution network owner would also need to separately hold a distribution operations licence.



Jacobs

Challenging today.
Reinventing tomorrow.

# Water supply requirements in the North and South Burnett

# Appendix C

## Strategic business case

April 2020

# Risk register

The risk management approach is aligned with the DNRME risk matrix.

**Table D1: DNRME Risk Analysis and Scoring Matrix**

| Likelihood / consequence | Insignificant | Minor | Moderate | Major | Catastrophic |
|---|---|---|---|---|---|
| Almost certain | Medium (11) | Medium (16) | High (20) | Extreme (23) | Extreme (25) |
| Likely | Low (7) | Medium (12) | High (17) | High (21) | Extreme (24) |
| Possible | Low (4) | Medium (8) | Medium (13) | High (18) | High (22) |
| Unlikely | Low (2) | Low (5) | Medium (9) | Medium (14) | High (19) |
| Rare | Low (1) | Low (3) | Low (6) | Medium (10) | Medium (15) |

*Source: (Department of Natural Resources, Mines and Energy, 2017, p. 15)*

**Table D2: DNRME risk likelihood categories**

| Likelihood | Description | Example to assist stakeholders |
|---|---|---|
| Almost certain | The event is expected to occur in most circumstances | May occur once a year or more |
| Likely | The event will probably occur in many circumstances | May occur once every 3 years |
| Possible | Identified factors indicate the event could occur at some time | May occur once every 10 years |
| Unlikely | The event could occur at some time but is not expected | May occur once every 30 years |
| Rare | The event may occur only in exceptional circumstances | May occur once every 100 years |

*Source: (Department of Natural Resources, Mines and Energy, 2017, p. 15).*

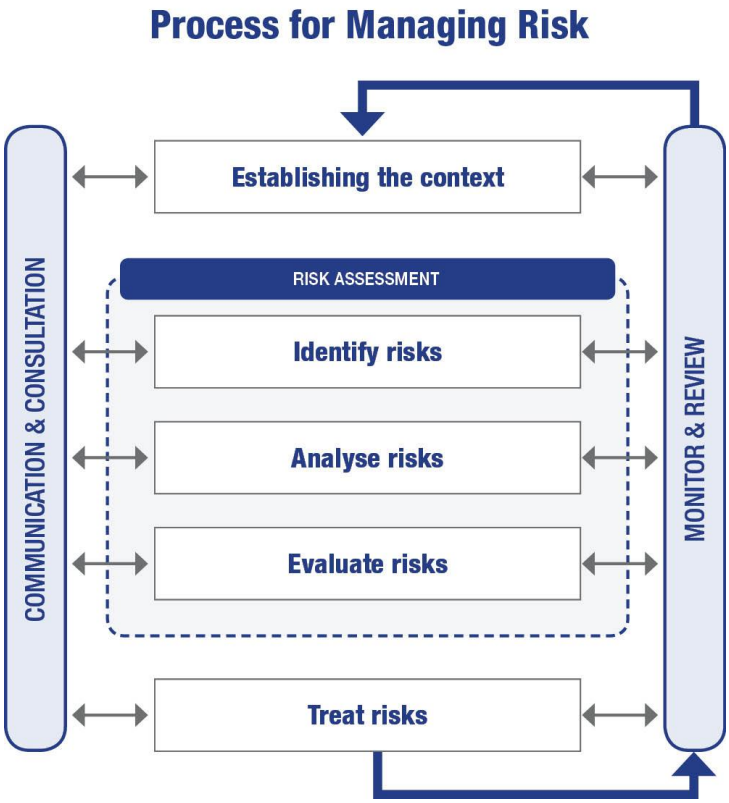
The range from 'yearly' to 'every 100 years' is appropriate for water infrastructure related risks.

**Table D3 Risk consequences—impact on business case delivery / realisation of benefits**

| Insignificant | Minor | Moderate | Major | Catastrophic |
|---|---|---|---|---|
| Negligible impact on business case delivery / realisation of project benefits | Minor impact on business case delivery / realisation of project benefits | Moderate impact on business case delivery / realisation of project benefits | Major impact on business case delivery / realisation of project benefits | Catastrophic impact on business case delivery / realisation of project benefits (cannot be realised) |

*Source: Adapted from (Department of Natural Resources, Mines and Energy, 2017).*

**Figure D1: DNRME risk management process adopted**




*Source: (Department of Natural Resources, Mines and Energy, 2017, p. 2).*

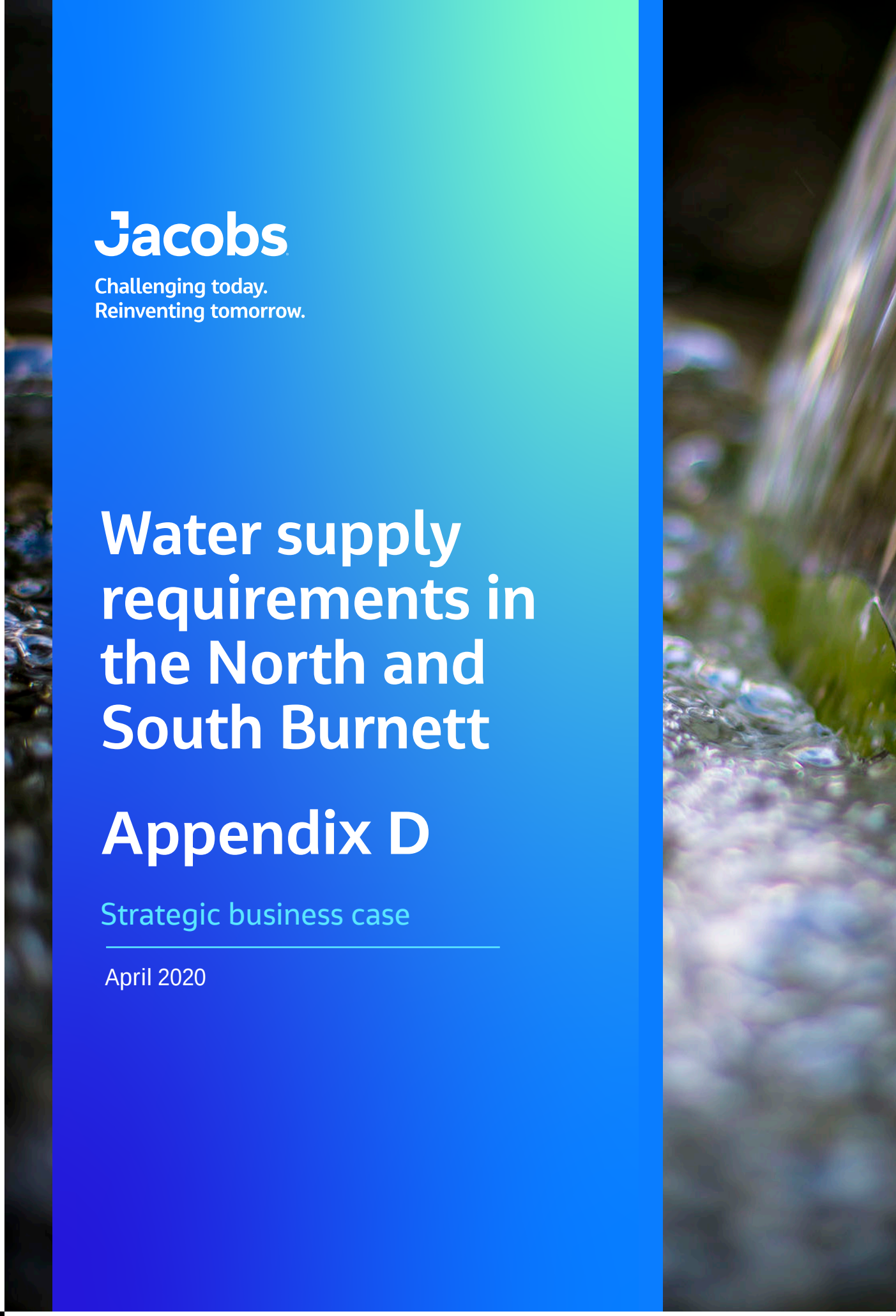
The risk register developed for the proposal is provided below.

**Table D 4: Risk Register**

| Risk no. | Risk description | Trigger | Impact | Likelihood | Consequence | Rating | Control strategy |
|---|---|---|---|---|---|---|---|
| **Process risks** | | | | | | | |
| 1 | Change of government or mayor/councillors | Council election (March 2020)<br>Federal election (due 2022) | Possible change in NWIDF policy<br>Mayor/council changes impacting acceptance of SBC direction or conclusions | Possible | Moderate | Medium | Comply with good business case practices through an unbiased assessment |
| 2 | Councils do not support project outcomes | Completion of demand and other assessments resulting in recommendations of fewer or different investments than anticipated by the council | The SBC or PBC not approved by the project steering committee, resulting in rework, delays or loss of project funding | Possible | Moderate | Medium | Comply with good business case practices through an unbiased assessment |
| 3 | Ineffective, duplicated or conflicting communications | Concurrent, related and overlapping Burnett feasibility (NWIDF), BQ and | Frustrated, disengaged or confused stakeholders leading to project | Likely | Moderate | High | Consolidate stakeholder lists and outline timelines for stakeholder engagement—to be |

| Risk no. | Risk description | Trigger | Impact | Likelihood | Consequence | Rating | Control strategy |
|---|---|---|---|---|---|---|---|
| **Process risks** | | | | | | | |
| | | Sunwater processes and studies | delays, potential loss of project funding and/or reputational damage to the council, state and consultants | | | | coordinated with other studies<br>Streamline engagement activities across the NWIDF, BQ and Sunwater Blueprint processes |
| 4 | Delays to concurrent dependent strategic plans and studies | Paradise Dam study, Sunwater Regional Blueprint, SEQ WSP, and Kingaroy Regional Water Supply Security Assessment decisions and outcomes delayed | Uncertainty regarding project option viability and performance precludes development of project conclusions and recommendations resulting in project delays and potential loss of project funding | Possible | Major | High | Seek regular briefings on direction and likely outcomes of concurrent planning and studies |
| 5 | Risk that there is limited additional demand | Completion of a demand assessment | The project recommends little or no public investment and does not proceed | Possible | Moderate | Medium | Engage an experienced party with an understanding of irrigation to forecast demand |
| 6 | Lack of Seqwater, DNRME or Sunwater support | Lack of support for options affecting and/or requiring approval by Seqwater, DNRME or Sunwater | Many options difficult or impossible to progress , resulting in rework, delays or loss of project funding | Unlikely | Major | Medium | Close and continual engagement |
| **Proposal risks** | | | | | | | |
| 7 | Biosecurity | A biosecurity threat (e.g. fireants) is found that limits the capacity to grow and sell produce | Reduction in output; reduced demand for additional water | Unlikely | Moderate | Medium | |
| 8 | Climate change | Change in temperature, rainfall and number and severity of extreme events beyond what is already anticipated | Lower than expected water security and reduced agricultural production | Possible | Major | High | Ensure resilience to climate change is a key consideration in filtering and evaluating project options |
| 9 | The industry is government-led rather than market-led | Unexpected changes to policy, regulation or legislation | Markets signal that is affected, and inefficient decision-making | Unlikely | Moderate | Medium | Ensure the business case clearly communicates to government the risks that excessive |

| Risk no. | Risk description | Trigger | Impact | Likelihood | Consequence | Rating | Control strategy |
|---|---|---|---|---|---|---|---|
| **Process risks** | | | | | | | |
| | | | | | | | market intervention can have on benefits realisation |
| 10 | Export markets | Geopolitical developments lead to increased protectionism and trade restrictions | Limited export opportunities resulting in reduced demand and margins, and ultimately in reduced output | Possible | Moderate | Medium | |
| 11 | The project analysis overestimates demand | Poor information or inaccurate assumptions informing demand assessment<br>Market demand satisfied by increased production and investment in other regions | Underutilised water allocations and reduced agricultural investment and value-add | Unlikely | Major | Medium | Apply best practice forecasting methodology<br>Engage an experienced party with an understanding of irrigation to forecast demand<br>Ensure that potential infrastructure investments in other regions inform project demand assessment |
| 12 | Unexpected outcomes from related and overlapping BQ and Sunwater processes and studies | Water infrastructure investment decisions made prior to decisions regarding the long-term future of Paradise Dam and other related assets and policies | Benefits are not fully realised due to the selection of a suboptimal project option | Possible | Major | High | Seek regular briefings on direction and likely outcomes of concurrent planning and studies<br>Ensure business case investment recommendations are conditional on outcomes of related studies |



Jacobs

Challenging today.
Reinventing tomorrow.

# Water supply requirements in the North and South Burnett

# Appendix D

## Strategic business case

April 2020

# Appendix D. Stakeholder engagement plan and register

The project requires significant stakeholder engagement in order to achieve its objective of identifying one or more reference projects that may best meet the needs of the region. In this examination of the region's supply/demand gap, it is critical to undertake strong stakeholder management, engaging appropriately with the relevant people at the right time.

Stakeholders will provide:

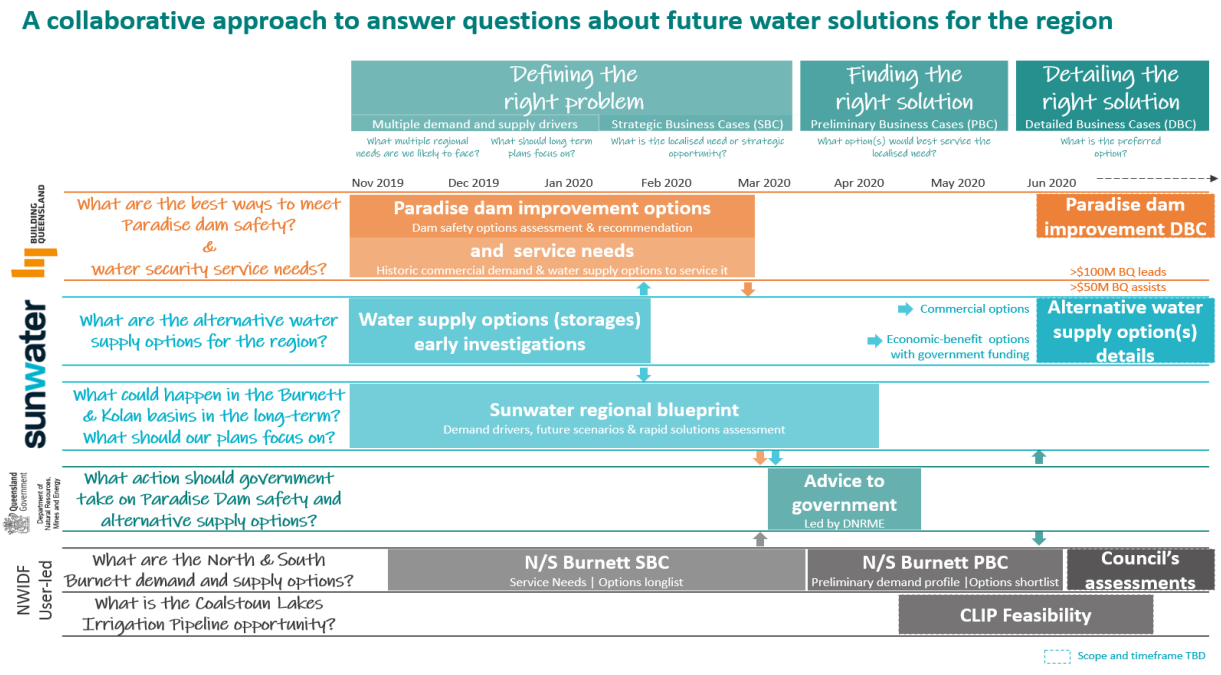
- assistance in identification of the problem, the needs of the region and available opportunities;
- collaboration in development of a longlist of options to solve the identified problem or opportunity;
- a source of primary data and lived experience for market insight, refinement of the service need and determination of demand;
- refinement of selection criteria relevant to commercial irrigators, the environment, the community, Sunwater, government and regulators; and
- support for the solution.
- They are essential to the success of the project.

This Stakeholder Engagement Plan (SEP) adopts an open and exploratory perspective of water demand and supply in the study region and demonstrates the commitment to engagement and learning from those with not only a detailed knowledge of water supply and demand issues, but also the region. It seeks to balance the objectives and outcomes of the project with the expectations of its stakeholders.

There are another two concurrent studies being undertaken exploring water options in the region. Sunwater is undertaking its Regional Blueprint on the infrastructure and opportunities within the Burnett Basin over November and December 2019 while Building Queensland is investigating long-term options related to Paradise Dam over the period to February/March 2020. As each of these studies will engage key stakeholders, coordination between the project teams will be crucial to minimise project confusion and engagement fatigue, as well as share learnings of mutual interest.

A graphical depiction of the various processes is shown below.

Figure D.1: Stakeholder Engagement Process for project



This Stakeholder Engagement Plan (SEP) is a living document and will be adjusted throughout the project.

Approval by DRNME and the appropriate council will be obtained for all stakeholder engagement activities before any activities are implemented.

## D.1 Purpose and objectives of stakeholder engagements

### D.1.1 Purpose

Engagement with stakeholders will contribute to determining the range of potential initiatives to be explored, test the soundness and size of the opportunity in the final reference project and to influence the success of its outcome. Specifically, the engagement will assist with identification of the service need, options longlist, selection criteria, options shortlist and risk mitigation measures – all key elements of the project.

### D.1.2 Objectives

The goal of this SEP is to guide consultation with stakeholders that will allow us to:

- gain an early understanding of the needs of the region and problems to be addressed
- identify irrigators and how their needs can be considered in the final project recommendation
- provide clear communication pathways throughout the project – gathering information and providing consistent, frequent communications
- to ensure stakeholders are fully informed, understand the purpose of a strategic business case and preliminary business case and associated timeframes, and understand how they can provide meaningful input to the assessment process.
- ensure outcomes of the feasibility study have a high level of confidence that they are supported by stakeholders and meeting a direct need
- This SEP demonstrates that:
- all relevant stakeholders have or will be identified with their opinions reviewed and documented
- a hierarchy of stakeholders has been developed, taking into account stakeholders' ability to influence the project and the extent to which the project will affect them
- an assessment of acceptance of the outcomes is undertaken with alternative views addressed

## D.2 Stakeholders

Stakeholders of the project are those affected by current and future water supply in the Burnett region and well placed to assist the project, as well as those who can influence the outcomes of any proposed initiative.

### D.2.1 Key project stakeholders

The below table provides a summary of identified stakeholders and their interests in the project.

Table D.1: Key project stakeholders

| Stakeholder category | Stakeholder | Interest/s |
|---|---|---|
| Internal stakeholders | | |
| Project partners | Department of Natural Resources, Mines and Energy | • Administrative facilitator for the feasibility study |
| | North and South Burnett Regional Councils | • Recipients of the NWIDF funding |
| | Jacobs | • Lead consultant for feasibility study |
| Australian Government | | |
| Departmental Ministers | Minister for Agriculture and Water Resources | • Alignment with federal objectives and plans<br>• Infrastructure that is properly planned and timed<br>• Investment decision/approval of any further investigations and any resulting project outcomes<br>• Environmental approvals/ requirements |
| | Minister for the Environment and Energy | |
| | Minister for Infrastructure and Transport | |
| Elected representatives | Queensland Senators and Federal Members representing study areas – Maranoa, Flynn and Wide Bay. | • Alignment with federal objectives and plans<br>• Infrastructure that is properly planned and timed<br>• State, regional and local economic, social and environmental impacts |
| Australian Government departments and authorities | Department of Infrastructure, Transport, Cities and Regional Development | • Administration of the NWIDF<br>• Administration of funding for renewable energy projects<br>• Review of business cases<br>• Alignment with federal objectives and plans |
| | Department of the Environment and Energy | |
| | Infrastructure Australia | |
| Queensland Government | | |
| Premier and Departmental Ministers | Premier and Minister for Trade | • Investment decision/approval<br>• Alignment with other Queensland Government department objectives and plans<br>• Infrastructure investment that is properly planned and timed |
| | Queensland Treasurer | |
| | Minister for Natural Resources, Mines and Energy | |
| | Minister for State Development, Manufacturing, Infrastructure and Planning | |
| | Minister for Agricultural Industry Development and Fisheries | |
| | Minister for Environment and the Great Barrier Reef | |
| Elected representatives | State Members for Callide and Nanango | • Alignment with state objectives and plans<br>• Infrastructure that is properly planned and timed<br>• Local economic, social and environmental impacts |
| Queensland Government departments, authorities and corporations | Queensland Treasury | • Alignment with other Queensland Government department objectives and plans<br>• Infrastructure investment that is properly planned and timed<br>• Review, input and feedback on the SBC and PBC<br>• Alignment of parallel water studies in the region |
| | Department of Natural Resources, Mines and Energy | |
| | Department of State Development, Manufacturing, Infrastructure and | |

| | | |
|---|---|---|
| | Planning (including the Office of the Coordinator-General) | • Ongoing management and delivery activities – in particular, coordination of overlapping project stakeholder management activities |
| | Department of Agriculture and Fisheries | |
| | Department of Environment and Science | |
| | Building Queensland | |
| | Sunwater | |
| Local government | | |
| Councils | North Burnett Regional Council + South Burnett Regional Council | • Feasibility Study proponents<br>• Urban water supply security<br>• Agricultural and industrial water supply security<br>• Job creation in the region<br>• Impact on environment<br>• Advancing the area's status as an attractive place to invest<br>• Infrastructure location and planning<br>• Increasing agricultural and related industry production |
| Community and business | | |
| Community groups | TBC | • Local regional advocates for water supply security |
| Landholders | TBC | • Impact on existing water supply and environment<br>• Access to property |
| Potential customers | Parties that could receive water from the project | • Solutions to water supply issues<br>• Access to secure water<br>• Business growth and profitability |
| Environmental groups | TBC | • Minimisation and/or mitigation of environmental impacts<br>• Monitoring and reporting activities |
| Traditional owners/Aboriginal cultural heritage | TBC | • Any Native Title or cultural implications |
| Business | Coalstoun Lakes Development Group<br>Kingaroy Chamber of Commerce and Industry<br>Mundubbera Enterprise Association<br>Gayndah Chamber of Commerce<br>Burnett Inland Economic Development Organisation<br>Barker Barambah IAC<br>Boyne River and Tarong IAC<br>Three Moon Creek IAC<br>Upper Burnett IAC | • Removing impediments to business growth and regional economic prosperity<br>• Improved conditions for local residents, industry and other sectors<br>• Advancing growth<br>• Job creation in the region |
| | Large agricultural and industrial water users - TBC | |
| Industry peak bodies | TBC | • Improved conditions for industry sectors<br>• Advancing the region's status as an attractive place to invest |

| | | |
|---|---|---|
| Potential suppliers | TBC | • Scope of proposed initiatives as potential business generation |
| Media | TBC | • TBC |

## D.3 Methodology

Consistent with the guidance provided by BQ's SBC Framework, the following specific information and has been identified in the Stakeholder Engagement Plan.

- Stakeholder name & description
- · Extent of stakeholder interest and influence in service need/potential initiative
- · Stakeholder score
- · Proposed mechanism for stakeholder engagement (inform, consult, active participation)
- · Risk of engaging (or not) with stakeholder
- · Proposed strategies of managing stakeholder risks.

This SEP follows the Building Queensland framework for stakeholder engagement, balancing the benefits of better outcomes through improved articulation of the service need with the risks of engagement in the process. Stakeholder expectations will be clearly managed throughout.

Stakeholders will continue to be identified throughout the preparation of the SBC and PBC, as the proposal progresses, with activities designed to meet their unique needs.

## D.4 Council messaging

Each of the councils are responsible for communication with the broader public in their respective council areas. The councils intend to take a different approach to seeking input from the community. However, some messages may be in common. Some core messages include:

> South and North Burnett Regional Councils have together secured National Water Infrastructure Development Fund (NWIDF) funding to identify the long-term water needs of the region and assess options for meeting those needs.
>
> The project aims to identify and progress projects to improve water reliability of existing supplies for towns, business and irrigated agriculture in the Burnett, to boost the economic dynamics in the region and to underpin future investment. The program will directly focus on identifying ways to create more water for our region and also on key projects that improve the reliability of existing allocations.
>
> This phase of the study – the strategic and preliminary business case – will by mid-2020 generate a short list of the most promising water infrastructure and related options to meet the region's key water needs. From there the preferred option for each council area will be designed and costed in a late 2020 detailed business case.
>
> The NWIDF Burnett water feasibility study will be coordinated in partnership between South Burnett Regional Council, North Burnett Regional Council, Department of Natural Resources, Mines and Energy, and Sunwater. We were recently pleased to announce that Jacobs have been appointed as our lead consultant for the program and have extensive experience across this field.

We are excited that the water agenda has become prominent at all levels of government, and the NWIDF Burnett Feasibility Study is one of three critical and concurrent pieces of information that will shape our future water strategies.

It is up to council how they chose to communicate with their stakeholders.

## D.5 Stakeholder Scoring

Each stakeholder is provided a score based on their interest in (impact) and influence on the project.

The scoring matrix used in this process in outlined below.

Figure D.2: Scoring matrix used in stakeholder consultation

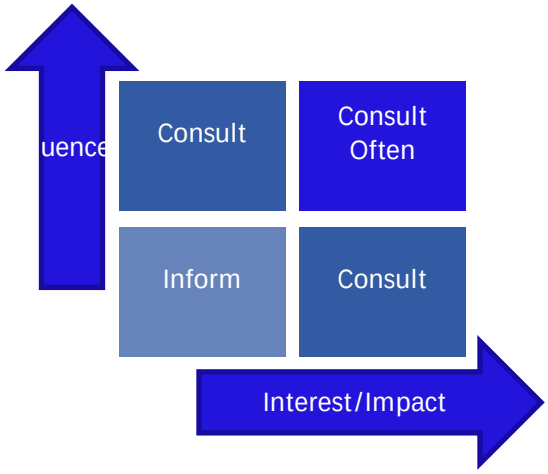
| | | Interest/Impact Level | | |
|---|---|---|---|---|
| | | Low | Medium | High |
| Influence Level | Low | 2 | 4 | 6 |
| | Medium | 3 | 6 | 9 |
| | High | 4 | 8 | 12 |

The scoring matrix uses a standard multiplier to develop a total score which combines the overall influence and interest the stakeholder has in regard to the project. For example, a stakeholder with a low influence and interest level would receive a score of 2.

The higher the score the more importance and rank that was associated with the particular stakeholder for the project.

### D.5.1 Stakeholder Strategy

Jacobs will undertake stakeholder engagement through its tried and tested methodologies with its distinctive authentic, commercial and engaging style.




Stakeholder engagement will be undertaken as a tailored, multi-channel and phased approach, applied variously according to the stakeholder and the needs of the project stage. Reflecting the importance of stakeholder input to the success of the project outcomes, the project team will focus its attention on a small group of representative stakeholders with a high degree of interest in water supply and influence over the outcome.

It will engage these stakeholders over the life of the project, from identification of the problem and creation of a longlist of solutions to selection criteria and ultimately endorsement of the outcomes.

### D.5.2 Key messaging

Specific messages will be developed for the various activities within the plan, tailored for the stakeholder and the outcomes required from the activity. Foundational messages for stakeholders as they are engaged will be:

- Stakeholders are being engaged from the very beginning of the project and throughout the development the feasibility study of water supply options for the region, ensuring the solution is developed with deep consideration of a broad range of perspectives.

- Stakeholder input has been recognized as critical to the development of an optimal water supply solution for the Burnett region, ensuring the outcome of the study for North Burnett and South Burnett Regional Councils is the identification of a reference project which best meets the needs of the entire region and those affected by it.
- This is an important opportunity for those impacted by water issues in the Burnett to provide substantial input at its earliest exploratory stages, influencing the future of water management and contributing to the region's sustained prosperity.
- We will work with you to ensure your concerns and aspirations are directly reflected in the options explored and identification of the preferred solution.

## D.6 Stakeholder Engagement Plan

Stakeholders will be engaged at different levels according to the needs of the stage of the development of the study and the needs of the stakeholder. In the earliest phases we will predominantly employ one-to-one communications, with formal group discussions to be commenced mid-way through the development of the SBC. This approach recognizes two other concurrent water supply investigations being conducted for Sunwater and Building Queensland. Coordination with both concurrent studies is required, to avoid multiple approaches to the same individuals, to be achieved with the assistance of DRNME by December 2019.

Jacobs will commence with each of the proponent Councils to validate their respective objectives and expectations for the project, provide early insight into the region's water issues, options for further exploration and identify further stakeholders to be engaged.

Once agreement on the approach and timing is achieved with all concurrent projects, having identified and compiled a final list of a small but influential group of stakeholders, Jacobs will undertake in-depth, one-on-one discussions, including current and potential customers. These face-to-face interviews will be supported with emails and phone conversations as required.

Investment Logic Map workshops will then be undertaken, heralding the formal phase of the SEP, gathering insights and data and deploying a feedback loop to support continuous engagement as the project moves to shortlist potential initiatives and undertake appropriate assessments to achieve a final reference project which is sound and welcomed.

Table D.2: Stakeholder Engagement Plan (SEP)

| Rank | Stakeholder entity | Contact Name | Interest level (H,M,L) | Influence level (H,M,L) | Score | Proposed mechanism and actions | Engagement Plan (frequency and timing) | Risk of not consulting (or risk of consulting) | Risk management strategies |
|---|---|---|---|---|---|---|---|---|---|
| =1 | Department of Natural Resources, Mines and Energy | TBC | H | H | 12 | • Formal updates and presentations at monthly meeting<br>Regular direct communication<br>• Invites to public meetings and other key discussions | • Formal monthly updates<br>Ad hoc discussions on key matters | • Disruption to project delivery<br>• Rework and delays to milestones<br>• Misinformation about the project<br>• Misalignment of project expectations | • Ongoing constructive communication<br>• Share initial findings and seek feedback |
| =1 | Councils | North Burnett Regional Council<br>South Burnett Regional Council | H | H | 12 | • Represented on Project Steering Committee<br>• Regular communication and meetings with senior executives and Councilors<br>• Offer of project briefings | • Monthly or more frequent if required on particular matters | • Disruption to project delivery<br>• Unable to receive Council support for project<br>• Misinformation about the project<br>• Misalignment of competing interests and project expectations | • Regular contact with senior executives and Councilors<br>• Promote the community benefits and positive impact to the region of the project |

| Rank | Stakeholder entity | Contact Name | Interest level (H,M,L) | Influence level (H,M,L) | Score | Proposed mechanism and actions | Engagement Plan (frequency and timing) | Risk of not consulting (or risk of consulting) | Risk management strategies |
|---|---|---|---|---|---|---|---|---|---|
| =1 | Project Steering Committee (TBC) | TBC | H | H | 12 | • Weekly telephone update<br>• Provision of draft chapters<br>• Invited to stakeholder workshops | • Weekly updates<br>• Draft chapters as per project plan | • Disruption to project delivery<br>• Rework and delays to milestones<br>• Misinformation about the project<br>• Misalignment of project expectations | • Ongoing constructive communication<br>• Share initial findings and seek feedback on draft DBC by chapter |
| =1 | Potential customers | Parties that could receive water from proposed solution | H | H | 12 | • Regular communication through face-to-face meetings and phone conversations<br>• Invited to stakeholder workshops, including ILM<br>• Supported with written communication through e-mails and overview documents | • Direct communications throughout project<br>• On an as-needs basis for specific matters | • Lack of project support<br>• Not delivering a project meeting customer requirement<br>• Misinformation about the project | • Regular engagement on the opportunities identified through the project<br>• Continuous engagement to gather input and response to proposed initiatives |
| =5 | Federal departments and authorities | • Department of the | H/M | H | 10 | • Regular updates on project status | • Regular project updates | • Disruption to project delivery | • Providing regular updates and presenting |

| Rank | Stakeholder entity | Contact Name | Interest level (H,M,L) | Influence level (H,M,L) | Score | Proposed mechanism and actions | Engagement Plan (frequency and timing) | Risk of not consulting (or risk of consulting) | Risk management strategies |
|---|---|---|---|---|---|---|---|---|---|
| | | Environment and Energy<br>• Infrastructure Australia | | | | via Queensland departments<br>• Specific and direct engagement on matters of interest and/or areas requiring feedback and guidance | • On an as-needs basis for specific matters | • Rework and delays to milestones<br>• Misinformation about the project<br>• Misalignment of project expectations | an understanding of the opportunities and challenges of the project |
| =5 | State departments, authorities and corporations | • Queensland Treasury<br>• Department of Natural Resources, Mines and Energy<br>• Department of State Development, Manufacturing, Infrastructure and Planning (including the Office of the Coordinator-General)<br>• Department of Agriculture and Fisheries | H/M | H | 10 | • Regular updates on project status through DNRME<br>• Specific and direct engagement on matters of interest and/or areas requiring feedback and guidance | • Regular project updates<br>• On an as-needs basis for specific matters | • Disruption to project delivery<br>• Rework and delays to milestones<br>• Misinformation about the project<br>• Misalignment of project expectations | • Providing regular updates and presenting an understanding of the opportunities and challenges of the project |

| Rank | Stakeholder entity | Contact Name | Interest level (H,M,L) | Influence level (H,M,L) | Score | Proposed mechanism and actions | Engagement Plan (frequency and timing) | Risk of not consulting (or risk of consulting) | Risk management strategies |
|---|---|---|---|---|---|---|---|---|---|
| | | • Department of Environment and Science<br>• Sunwater | | | | | | | |
| =7 | Business | • Kingaroy Chamber of Commerce and Industry<br>• Gayndah Chamber of Commerce<br>• Burnett Inland Economic Development Organisation<br>• Coalstoun Lakes Development Group<br>▪ Barker Barambah IAC<br>▪ Boyne River and Tarong IAC<br>▪ Three Moon Creek IAC<br>• Upper Burnett IAC<br>• Others TBC | M | L | 8 | • Specific and direct engagement on matters of interest and/or areas requiring feedback and guidance<br>• Invitation to participate in workshops | • On an as-needs basis on specific matters | • Disruption to project delivery<br>• Lack of interest or readiness for project<br>• Misinformation about the project | • Engagement at specific stages of the project<br>• Providing a clear understanding of the relevant expectations and opportunities with the project |
| =8 | Media | • TBC | M | M | 8 | • Regular updates on project status | • TBC in consultation with proponents | • Misinformation about the project Misalignment | • Providing regular updates and presenting an |

| Rank | Stakeholder entity | Contact Name | Interest level (H,M,L) | Influence level (H,M,L) | Score | Proposed mechanism and actions | Engagement Plan (frequency and timing) | Risk of not consulting (or risk of consulting) | Risk management strategies |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | • Specific updates on project milestones and matters of interest | | of project expectations | understanding of the opportunities and challenges of the project |
| =8 | Community groups | • TBC | M | M | 6 | • Specific and direct engagement on matters of interest and/or areas requiring feedback and guidance | • On an as-needs basis on specific matters | • Misinformation about the project<br>• Misalignment of project expectations | • Engagement at specific stages of the project |
| =10 | Environmental groups | • TBC | M | L | 4 | • Specific and direct engagement on matters of interest and/or areas requiring feedback and guidance | • On an as-needs basis on specific matters | • Misinformation about the project Misalignment of project expectations | • Engagement at specific stages of the project |
| =17 | Potential contractors | • Parties that could tender for any resulting project | M | M | 4 | • Specific and direct engagement on matters of interest and/or areas requiring feedback and guidance | • On an as-needs basis on specific matters | • Lack of interest or readiness for project<br>• Misinformation about the project | • Engagement at specific stages of the project<br>• Providing a clear understanding of the relevant expectations and |

| Rank | Stakeholder entity | Contact Name | Interest level (H,M,L) | Influence level (H,M,L) | Score | Proposed mechanism and actions | Engagement Plan (frequency and timing) | Risk of not consulting (or risk of consulting) | Risk management strategies |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | opportunities with the project |
| =17 | Landholders | TBC | H | H | 4 | • Invitation to participate in workshops<br>• Regular contact with updates of the project and potential impacts to property | • Regular bi-monthly contact or more frequent when required | • Disruption to project delivery<br>• Potential to be obstructive towards any future initiatives<br>• Misinformation about the project | • Regular and honest engagement<br>• Involvement in the process |
| =17 | Traditional owners / Aboriginal cultural heritage | TBC | | | | • | • | • | • |
| =17 | Industry peak bodies | TBC | M | L | 4 | • Specific and direct engagement on matters of interest and/or areas requiring feedback and guidance | • On an as-needs basis on specific matters | • Misinformation about the project<br>• Misalignment of project expectations | • Engagement at specific stages of the project<br>• Providing a clear understanding of the relevant expectations and opportunities with the project |

## D.7 Stakeholder engagement register

The following Stakeholder Engagement Register (SER) table has been developed to provide a summary of key findings arising from engagement with key stakeholders in the project region. The method of documentation for this project is in accordance with the stakeholder engagement plan and Building Queensland guidelines.

It contains record of all stakeholders, contacts, dates of engagement with comments or summarised key findings

Table D.3: Stakeholder Engagement Register (SER)

| Stakeholder entity | Key contacts | Score | Activity | Date | Summary of Key Findings (some confidential) |
|---|---|---|---|---|---|
| Internal Stakeholders | | | | | |
| Project Steering Committee | ▪ Trevor Harvey<br>▪ Ged Brennan<br>▪ Kristy Frahm | 12 | ▪ Project inception meetings<br>▪ Stakeholder List and Focus Group<br>▪ ILM Workshops – North and South Burnett | ▪ 25-27 November 2019<br>▪ 6 &12 February 2020 | ▪ Project manager (in conjunction with DNRME) and primary reviewer of the SBC.<br>▪ Provided key guidelines surrounding the writing of the report. Including relevant feedback on drafts, document style, formatting and document properties.<br>▪ Established the importance of providing a report that is based on evidence and economic data to support the need to for improvement. It also requires a document to communicate with the community it serves.<br>▪ Key role in the engagement of key stakeholders, including the Australian, Queensland and local governments.<br>▪ Noted the importance of maintaining an extensive options list to allow for the best decisions to be made.<br>▪ The North and South Burnett must both benefit out of the study. |
| Australian Government | | | | | |
| Department of the Environment and Energy | | 10 | ▪ Project update and progress report via Queensland Government Department | ▪ Ongoing | ▪ Update on the project and progress to date, including support of the project going forward.<br>▪ Will continue to consult throughout the business case process. |
| Infrastructure Australia | | 10 | ▪ Project update and progress report via Queensland Government Department | ▪ Ongoing | ▪ Update on the project and progress to date, including support of the project going forward.<br>▪ Will continue to consult throughout the business case process. |

| Queensland Government | | | | | |
|---|---|---|---|---|---|
| Queensland Treasury | | 10 | ▪ Project update and progress report via DNRME | ▪ Ongoing | ▪ Update on the project and progress to date, including support of the project going forward.<br>▪ Will continue to consult throughout the business case process. |
| Department of Natural Resources, Mines and Energy (DNRME) | ▪ Paul Hope<br>▪ Grant Horton<br>▪ Ubong Ntuk<br>▪ Other officers | 12 | ▪ Project Inception meeting<br>▪ Sunwater Scenario Planning Workshop<br>▪ ILM Workshops – North and South Burnett | ▪ 31 October 2019<br>▪ 4-5 December 2019<br>▪ 6 &12 February 2020 | ▪ Update on progress of the project. Including the progression of parallel studies.<br>▪ Update and discussion on the water plan and unallocated water in region.<br>▪ Discussion on the seeking support for the unallocated water allocation required for the project.<br>▪ Project management arrangements and scope requirements<br>▪ Expectation that the business case is comprehensive, and the process is collaborative |
| Department of State Development, Manufacturing, | ▪ Principal Economist<br>▪ Fiona Bowden (Bundaberg)<br>▪ Other officers | 10 | ▪ Project update and progress report.<br>▪ Sunwater Scenario Planning Workshop | ▪ Ongoing<br>▪ 4-5 December 2019 | ▪ Update on the project and progress to date, including support of the project going forward.<br>▪ Will continue to consult throughout the business case process. |
| Infrastructure and Planning (including the Office of the Coordinator-General) | ▪ Scott Taylor<br>▪ Karen Oatley<br>▪ Steven Tarte<br>Maxine Hunter | 10 | ▪ Project update and progress report. | ▪ Ongoing | ▪ Update on the project and progress to date, including support of the project going forward.<br>▪ Will continue to consult throughout the business case process. |
| Department of Agriculture and Fisheries | ▪ Bernadette Ditchfield – Deputy Director General<br>▪ Elton Miller – Executive Director | 10 | ▪ Project update and progress report. | ▪ Ongoing | Update on the project and progress to date, including support of the project going forward. |

| | | | | | |
|---|---|---|---|---|---|
| Department of Environment and Science | ▪ Richard Routley – Regional Director | 10 | ▪ Project update and progress report. | ▪ Ongoing | ▪ Update on the project and progress to date, including support of the project going forward.<br>▪ Will continue to consult throughout the business case process. |
| Sunwater | ▪ Gloria Vega<br>▪ Lisa Welsh<br>▪ Peter MacTaggart | 10 | ▪ Sunwater Scenario Planning Workshop | ▪ 4-5 December 2019 | ▪ 2-day workshop in Bundaberg with Sunwater and key stakeholders to discuss scenario planning and opportunities for the Wide Bay Burnett and respective Sunwater schemes.<br>▪ The process for Sunwater's regional blueprint framework is as follows:<br>1) Diagnostic Scenarios<br>2) Solution & identification<br>3) Rapid economic and financial assessment<br>4) Solutions by scenario and region<br>▪ Introduction and discussion on future global trends that will affect the water sector (now until 2040)<br>▪ Discussion occurred around on how these trends will affect the region in the future.<br>▪ Persistent drought will have and is currently having an impact on the regions production. There is a need for an integrated water resource management plan.<br>▪ High youth unemployment and aging population in the region. Education levels are one of the lowest in QLD. Many community members are currently disengaged. Bundaberg has signed up for the cashless card trials.<br>▪ Climate adaptation and usage efficiencies will be very important for the region moving forward.<br>▪ Diversification – urban mining and agriculture and smart investment in infrastructure in the region<br>▪ Local employment - Health Retail and Education largest employers followed closely by agriculture.<br>▪ Boyne region – MP customers have been cut off for over 9 months. Tarong Power Station has a HP allocation of 30,000ML.<br>▪ The Wide Bay Burnett (ABS region) one of QLD's largest producers of Mandarins, Avocados and 3rd largest sugar producer<br>▪ There were group discussions about what makes the Burnett region unique:<br>- Fertilised soils – great for growing HV produce<br>- Access to a port from a variety of areas<br>- Closeness to major market hubs (SEQ and also Sydney/Melbourne<br>- Diversity of produce you can grow<br>- Cyclone risk is minimal |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | - One of the few regions that creates more power than it uses.<br>- Technology advances – region has been quite proactive and committed to the uptake of new technology<br>- Stable economic area – not boom or bust. Does not rely predominately on one specific industry for success.<br>▪ Water is still available in the region as opposed to other areas that are struggling to have any water for production.<br>▪ DNRME 62 options report 2001 was mentioned as original source of the Sunwater long list of options for region<br>▪ Sunwater Introduced process to arrive at short list of 14 options. This included new infrastructure and upgrades/raising of existing infrastructure. These options were as follows:<br>1) Bucca Weir Raising (Bundaberg)<br>2) Ned Churchward Offstream Storage<br>3) Ned Churchward Weir – 2m Raising<br>4) Gregory River Dam<br>5) Reids Creek Dam<br>6) Degilbo Creek Dam<br>7) Mt Lawless Offstream Storage<br>8) Jones Weir Raising (1.4m)<br>9) Claude Wharton weir (2m raising)<br>10) Boonara Dam<br>11) Auburn River Weir<br>12) Cooranga Weir<br>13) Barlil Weir<br>14) Calibar Dam (mega dam inundates Paradise Dam) |
| Stanwell Corporation | Liz Beavis<br>Kirk McNaughton<br>Jayden Flint | 12 | ▪ Tarong Power Station – site visit and discussion with stakeholders: | ▪ 13 February 2020 | ▪ Face to face meeting to discuss Tarong power stations water usage<br>▪ Established lines of communication moving forward through study.<br>▪ Provided update and brief background on the project and progress to date<br>▪ Cooling water dam on site (storage 3,000ML). Receives water from Wivenhoe to Tarong Pipeline.<br>▪ Boondooma Pipeline goes straight into plant for usage. 29,270 ML allocation (80ML/day).<br>▪ Can almost use Wivenhoe water twice as many times water sourced from Boondooma Dam based on the release limits. |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | ▪ Meandu Creek Dam (storage also 3,000ML). Receives blowdown form Stations (When EC limit is reached) Release downstream from this dam. Like to keep storage above 70% at all times. Currently releasing 5ML/day but have the ability to go up to 45ML/day in extreme circumstances.<br>▪ Downstream irrigators would like 20 ML/day so to get water down to Glenmore Gauging station. Rarely makes it to BP Dam.<br>▪ Estimated 17 years left of operation at this site (2037).<br>▪ Stanwell have a bulk water supply agreement from Seqwater (Not an allocation). Wivenhoe pipeline commissioned in 1998. 2007 Tarong reduced capacity due to water availability. Damaged Pipeline and pump station which took pipeline offline in 2012.<br>▪ Stanwell will not take water below 8 per cent (storage) in Boondooma dam. The current dead storage level is at 4 per cent.<br>▪ Current investigations into how to further reduce water use on site and during operation. |
| Local government | | | | | |
| North Burnett Regional Council | ▪ Rachel Chambers, Mayor<br>▪ Rachel Cooper CEO<br>▪ Councillor Faye Whelan<br>▪ Justin Kronk, General Manager Strategy, Innovation & Assets<br>▪ Trevor Harvey Project Manager for NBRC | 12 | ▪ North Burnett Immersion Workshop | ▪ 27 November 2019 | Overview<br>▪ The goal is to deliver a feasibility study with integrity that gets the right answer. On the two preferred projects the aim is clarity, that is, either elevate and construct (one or both) OR put to bed for ever one or both (i.e. provide clarity on the feasibility or lack of feasibility). The language on the two major projects is:<br>▪ Coalstoun Lakes – The Mayor says this is an opportunity.<br>▪ Boyne “Water reliability solution” – The Mayor said this is addresses a problem (but acknowledges it is also an opportunity for expansion). The goal is to increase reliability in the Boyne River Scheme. For example, and very importantly – despite popular misconceptions – the solution may not be a single Karanga Weir / regulating weir. Rather, it may be two weirs. Either way a re-write of the WRP and the ROP is required.<br>▪ Problem – The Boyne is looking at 900 jobs lost. The Smart Berries 500 people. The other crops (citrus and nuts) may shed 400 jobs. BIEDO engaged ARUP wrote a report on the problem.<br>▪ Opportunity – Excitingly, the citrus, nuts and blueberries can massively expand in the Boyne scheme. This could get us to critical levels of higher production that leads to a processing plant locally.<br>Supply Notes – Options Long List<br>▪ Water for Coalston Lakes could come from Paradise or the Barker Barambah (or Wivenhoe).<br>▪ A discussion with John revealed the following long-list options for storing up to 100,000 ML including: |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | ▪ Barker Creek – upstream of Ban Ban Springs (3km upstream) and this weir site could also supply Coalstoun Lakes via a 5 km pipeline. Very worthy of long list.<br>▪ Boyne River – one or two sites for weirs (Trevor knows)<br>▪ Burnett River (upstream of Paradise Dam) – and both Barker and Boyne flow into Burnett River. There is a site 100 meters downstream of where the Barker Creek flows into the Burnett River that is known as the Aroona Weir site (e.g. 7-meter wall). It would flood some farming country but it is a very good weir site.<br>▪ Reids Creek – Flows to the Burnett River (between Barker and Boyne entering Burnett River). There was a very promising weir site 35km upstream from the Burnett River confluence. Reids Creek Weir (35kmk upstream from Burnett River on Reids Creek.<br>▪ Water Resources Commission report on all the major dams in the area.<br>Agricultural notes<br>▪ Perfect soil for blueberries<br>▪ The region has proven that it can provide, house, attract and sustain international workers (backpackers)<br>▪ Access to markets including Wellcamp Airport (24 hours to Asian breakfast tables) and Brisbane<br>▪ Rainfall is average 700mm (28 inches).<br>▪ Need more infrastructure on the Boyne system (water infrastructure is a problem – we need more)<br>▪ Mismanagement of water by SunWater (operating rules are a problem / releases that undermine North Burnett water security)<br>▪ Claude Warton Weir – has been good for three years (held at 80% full) – but one month ago they started releasing water from Claude Warton (it has fallen to 60%) – so this jeopardises water reliability for a number of irrigators as they have to excavate the impounded area for their pumps to reach water.<br>▪ The combined water security for citrus farmers (scheme plus on-farm storages and investment) used to give 3-5 years water security. However, revised security is now 2.5 years (2-3) which causes genuine stress in the farming community. It also prevents planting of new trees from the nursery / so the opportunity cost is forgone expansion of citrus or other crops.<br>▪ This was a cotton area – used to grow cotton on Councillor Whelan's farm.<br><br>Urban notes<br>▪ Biggenden is dire but a separate report is addressing. It could link into this project. |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | ▪ Burnett system supplies Gayndah and Munduberra and the high priority is ok. But the Munduberra supply is on the limit. The high priority water in Gayndah could assist.<br>▪ Gayndah had 1,000 ML of HP water and then NBRC sold 150ML to an orchard. Leaving 850ML. The price was about $2,000/ML for a permanent sale.<br>▪ Council also sold all its MP to blueberries – 500 ML – and the average price was about – $835/ML. |
| South Burnett Regional Council | ▪ Keith Campbell, Mayor of SBRC<br>▪ Mark Pitt CEO<br>▪ Aaron Meehan<br>▪ Kristy Champney<br>▪ Ged Brennan | 12 | ▪ South Burnett Immersion Workshop<br>▪ | ▪ 25 November 2019 | Summary of the need for water in SBRC:<br>1) Irrigated agriculture<br>2) Industrial water (e.g. bacon or other processing)<br>3) Urban growth.<br>▪ SBRC needs greater volumes of water allocations. The dry time is threatening these three opportunities.<br>▪ SBRC is geographically close to Wellcamp Airport, Brisbane Port, Bundaberg and the Sunshine Coast so it is good for market access.<br>Supply notes / all sectors<br>▪ Tarong Power station's future is key, but 2039 is the date at which it could close. If it closes 600-700 jobs could be lost. Action is needed to create jobs. Water and agriculture is a key opportunity for jobs. The Mayor worked for Bean Growers Australia for 40 years. There is a pipeline from Boondoomba Dam to Tarong Power Station.<br>▪ Opportunities include the spare water from a lowered Paradise Dam. The 100,000 ML from Paradise lowering, could be stored in a second stage of Boondoomba Dam. This would be an excellent option according to the Mayor – noting that all options are on the table for rational analysis.<br>▪ The Barlil Weir – was a study that went nowhere – it showed promise.<br>▪ The Barambah system is zero allocation at the moment. The ground water extraction in the Barambah system is being halved by SunWater and charges will still apply.<br>▪ Widebay Burnet Regional Organisation of Councils (SBRC is a member) – support additional water for the whole region.<br>▪ In the past the Murgon-South Burnett Meatworks at Murgon was operational and used large volumes of water. The meat works has closed– it does not and will not operate. There is spare capacity in Murgon for industrial expansion.<br>▪ Gordonbrook Dam is owned by council but controlled by SunWater. Council prefer to use Gordonbrook Dam rather than the low water quality of Boondoomba dam.<br>▪ Is the WCRW plant another possible source – noting the recycled water has limitations for green leafy vegetables and would be more suitable for tree crops. |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | Agricultural<br>▪ The soil types in South Burnett includes fertile and productive soils.<br>▪ Most irrigate from groundwater bores, and some have small allocations from schemes. None (or very few) farmers have substantial water in a reliable scheme.<br>▪ Water is needed to enable productivity in the agricultural sector.<br>▪ The Mayor got a group of farmers together to ask do you need more water? A resounding yes.<br>▪ The opportunities that exist are based on strong interest from agriculture. Likely to be a change in cropping practices (depending on the prices of water). So primarily the opportunity is in irrigated agriculture.<br>▪ The Mayor is aware of a lot of irrigators who do not pay much or anything for water. So, the attitude and response of irrigators from the region will need to be challenged.<br>▪ On the flipside, there are a large number of cotton growers on Barker Barambah – Byee Flats and Mondure. This is a flood plain so the risk is unacceptable for a tree crop rather than annual.<br>▪ The lack of demonstrated payment for water relates to a poor reliability product to date.<br>▪ Impacts of increased high-reliability water (new water) would be to see older farmers retire and the changing of hands of farms to younger and corporate farmers.<br>▪ The future must be water-efficient water use (e.g. drip irrigation orchards in the Kumbia District) – these large yielding farms achieve a great deal with very limited groundwater supplies only.<br>Industrial notes<br>▪ Then secondarily, another industry would be helpful. However, 300-500ML is probably not available.<br>▪ The Swickers Kingaroy Bacon Factory Pty Ltd at Kingaroy Barkers Creek Road is the largest urban water user by an order of magnitude. In recharge seasons, their bores work. Currently, they are short of water or it is somewhat insecure. Swickers wants to expand which will increase demand for pig production and therefore grain.<br>▪ Kingaroy could not accommodate another Swickers. This is a concerning constraint on industrial growth.<br>▪ In the past, a 10ML request was concerning in the Kingaroy system and the industrial development was denied partly due to a lack of water.<br>Urban notes<br>▪ Thirdly, Council is interested in urban growth. There was a recent MIP project – Maturing the Infrastructure Pipeline – that investigated the issues of urban water supply and there is a problem / risk of poor water security.<br>▪ Kingaroy cannot spare raw water for Nanango. As a result, Nanango is looking for a new raw water supply.<br>Stakeholders |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | ▪ The key stakeholders in the region include:<br>▪ Kingaroy Chamber of Commerce were strongly supportive and the network of such business development groups including in Murgon and Nanango are active.<br>▪ HQ Plantations – Own 70-80 properties for forestry. This is possibly the largest land owner in South Burnett.<br>▪ Crumpton Company – peanuts and duboisia production and are now trialling Macadamia – Have likely got the second largest number of properties in South Burnett. Sonie Crumpton, better known for peanuts and duboisia, is hoping this … are the most popular varieties currently being grown in the Bundaberg area. … have the potential of producing a greater kernel-to-shell ratio which … from Lismore, has been working with Sonie on the macadamia trial.<br>▪ Bega cheese who own the Peanut Company<br>▪ Costa Group – Avocadoes and Mangoes (large operations here and in Bundaberg)<br>▪ Swickers Sun Pork<br>▪ Proteco – manufacture of cold pressed seeds / oils (Sunflower and other oils)<br>▪ Wine industry locally<br>▪ Brett Hedding, McCullough Robertson Lawyers is a large investor in wines and olives in South Burnett<br>▪ Gina Rinehart has invested mainly beef (and could invest further in dairy)<br>▪ AAM - Coolabunia Saleyards will be operated by AAM Investment Group after the South Burnett Regional Council accepted the company's tender to take over. The 15-year-old company owns saleyards in NSW, Victoria and Queensland, and operates the Murgon saleyards (now known as the South Burnett Livestock Exchange). Mayor Keith Campbell said: "We have the facilities here and are happy to see them used, but we think it's likely that people who have a commercial interest in the livestock industry will do a better job operating them."<br>▪ There are many small stakeholders:<br>▪ Boehringer Ingelheim, a German pharmaceutical company, owns and operates duboisia farms in the South Burnett. Global head of chemical operations, Manfred Psiorz, said the chemists extracted scopolamine, an alkaloid, from the duboisia leaves.<br>▪ Piggeries and feedlots (large one near Proston) |
| South Burnett Regional Council | ▪ Allen Christensen<br>▪ Tim Low<br>▪ Aaron Meehan | 10 | ▪ Meeting with SBRC to discuss urban water demand | ▪ 12 February 2020 | Current Scenario (base case)<br>▪ There are 3 major sources of urban water. Bjelke Peterson Dam, Boondooma Dam (Boyne Tarong supply scheme)<br>▪ From and urban supply situation SBRC are most worried about Wondai, Murgon. This supply is sourced from Bjelke Peterson Dam (currently at 20%) |

| | | | | | |
|---|---|---|---|---|---|
| | ▪ Kristy Champney<br>▪ Ged Brennan | | | | ▪ The supply for Proston, Kingaroy and Blackbutt is also very stretched.<br>▪ Council has discussed releasing water to Ficks Crossing and then building a small pipeline form Murgon to Wondai. This would increase the urban supply by 4 months. The cost of this pipeline is expected to be $1 million dollars.<br>▪ Kingaroy has Gordonbrook dam to fall back on when the pipeline is offline. However, once Gordonbrook falls below 50% storage capacity in becomes almost unusable due to containments in the water.<br>▪ Council discussed the alternative of creating a 100-200ML storage that would be lined near Gordonbrook and top it up using the Boondooma pipeline.<br>▪ Council last year alone had to provided carted water to residents in Blackbutt 3-4 times.<br>▪ The supply of Gordonbrook between 100-50% can usually supply Kingaroy for up to 18 months. It is a council owned asset and is primarily used just for urban water.<br>▪ The existing bores surrounding Kingaroy are an option for emergency water supply, but there is issue with quality. Boondooma water is still the most important to urban supply.<br>▪ Approx. 3360 ML of dead storage in Boondooma Dam. Unsure who is entitled to that in emergency situations. In other regions this has been provided to urban water users (Macquarie Valley).<br>▪ Swickers (Industrial processing) sources its water from council. It is waiting to expand its operation in the region. |
| Businesses | | | | | |
| Kingaroy Chamber of Commerce and Industry | ▪ Rob Fitz-Herbert<br>▪ Paula Greenwood, Secretary | 8 | ▪ Stakeholder meeting | ▪ 12 February 2020 | ▪ Update on the project and progress to date, including support of the project going forward.<br>▪ Plenty of interested in greater water access. The Chamber of Commerce i has lots of contacts and information that they would be willing to provide for the study.<br>▪ Will continue to consult throughout the business case process. |
| Burnett Inland Economic Development Organisation | ▪ Kristy Frahm CEO | 8 | ▪ South Burnett Immersion Workshop<br>▪ Stakeholder List and Focus Group<br>▪ ILM Workshops – North and South Burnett | ▪ 25 -27 November 2019<br>▪ 6 &12 February 2020 | ▪ Face to Face meetings to introduce project team. Provided an overview and background of the project, including discussion around the objectives of the study.<br>▪ BIEDO have provided local content and on ground knowledge to support the business case. This knowledge has been incorporated throughout the register.<br>▪ They have an extensive network that has been critical to successful stakeholder engagement in the region.<br>▪ Will continue to consult throughout the business case process. |

| | | | | | |
|---|---|---|---|---|---|
| Coalstoun Lakes Development Group | ▪ Don Roberton<br>▪ Steve Marshall (President) | 8 | ▪ Coalstoun Lakes Meetings, visit and workshops | ▪ 5-6 February – Coalstoun Lakes | ▪ Face to Face meetings to introduce project team. Provided an overview and background of the project, including discussion around the objectives of the study.<br>▪ Eleven local farmers- both irrigators and potential irrigators attended the meetings and discussions. (The individual conversations and key findings are provided in the Potential customers section)<br>▪ Further face to face conversations have occurred.<br>▪ Will continue to consult throughout the business case process. |
| Swickers Kingaroy Bacon Factory | ▪ Linchon Hawks (General Manager)<br>▪ Dave Williamson (Service Support & Environmental Manager) | | ▪ Stakeholder meeting (1on1 conversation) | ▪ 11 & 17 March | ▪ Jacobs provided a summary of the progress to date on the Strategic Business Case.<br>▪ Swickers introduction – estimated that they currently only have 12 months' supply until being potentially cut off.<br>▪ Coronavirus has had a serious impact on production and throughput. Currently down on our forecasted position. Markets are down – grain prices are up.<br>▪ Looking to upgrade the water treatment plant to allow greater generation of recycled water on site. Business case has been prepared for government consideration.<br>▪ Discussion around current sources and total volumes of water used on site.<br>▪ Dave advised that Swickers had received a proposal from the company that would undertake the recycling project. A copy of the proposal has been provided to Jacobs.<br>▪ Confirmed that Swickers would be presenting on the recycling project to the Council on 18 March. Attending for the Council will be the Mayor, CEO and Aaron Meehan. |
| Potential Customers and Landholders | | | | | |
| Quebec Farms and Committee Member of the Boyne River and Tarong IAC | Troy Emmerton | 12 | ▪ Stakeholder meeting (1on1 conversation) | ▪ 27 November 2019 | ▪ Troy uses about 900ML per annum of 200 ha of citrus. Could expand up to 250ha on existing farm.<br>▪ Citrus – mandarins (90%), 5 percent lemons and 5 percent mangoes. 70 percent export of the mandarins and 30 percent domestic. Transitioning to 90 percent export and 10 percent domestic. Mainly to China and Thailand.<br>▪ Export $48 dollars per box of mercots for 18kg or 2.66 per kg from the Chinese. The profit is double that of the Australian supermarkets. The Thailand market wants small mandarins. The middle east market buy very small mandarins. The big ones go to the Chinese. The really big ones go to Taiwan.<br>▪ Supermarkets $24 dollars per box 9kg box of Imperial. The domestic market mandarin profit is 50% of the export market. Only mid-size.<br>▪ Onfarm storages give us up to 2 years of Onfarm water.<br>▪ Grows citrus. Large operations with huge potential to expand. Has 2,000ML of on-farm storage. Quebec Dam is on-farm storage and filled with unused allocated water and water harvesting. We used to buy water from sleepers. |

| | | | | | |
|---|---|---|---|---|---|
| Kerry Dove – Irrigator Coalstoun Lakes | ▪ Kerry Dove – Irrigator Coalstoun Lakes | 12 | ▪ Stakeholder meeting (1on1 conversation) | ▪ 27 November 2019 | ▪ Started farming in 1976 but is going backwards. We are looking for a solution. Getting water for Coalstoun Lakes is a necessity.<br>▪ Peanuts are a stable price and should provide a solid economic base |
| Kerry Dove – Irrigator Coalstoun Lakes | ▪ Kerry Dove – Irrigator Coalstoun Lakes | 12 | ▪ Stakeholder meeting (1on1 conversation) | ▪ 27 November 2019 | ▪ Has limited bores and is a dryland farmer. This is a small district with very good potential for irrigated agriculture. We are using drip tape and growing seedless melons. Also pumpkin on plastic. Row crops such as peanuts. There is a driver to take the water downstream (Burnett River). But would like to see some equity in the region. It would be fair if this water was to be shared.<br>▪ This great soil warrants some irrigation water. Traditionally, being peanut farmers (wheat and sorghum) and have branched into melons.<br>▪ The one thing that is important is your marketing. This area has the ability to manage risk and create money in lean conditions. There is skilled management here and that is critical to the success of the region. |
| Gary Hunter Coalstoun Lakes | ▪ Gary Hunter Coalstoun Lakes | 12 | ▪ Stakeholder meeting (1on1 conversation) | ▪ 27 November 2019 | ▪ This scheme is the future of the district. Grows dryland peanuts and corn. |
| Gary Hunter Coalstoun Lakes | ▪ Gary Hunter Coalstoun Lakes | 12 | ▪ Stakeholder meeting (1on1 conversation) | ▪ 27 November 2019 | ▪ We want 30-60GL piped to here. We started in the 1990s due to the huge potential of the region. We believe the water in Paradise Dam is just sitting there wasted.<br>▪ We want to use the water to create economic activity in the region. Even if we doubled our yield we could sell it all at premium prices. The peanut price is very resilient. The kids want to come home but if there is no water, then it is not viable enough to support young families. It is a tough life financially and we need to get water to bring home our kids to farm.<br>▪ We have changed our farming practices to be more and more water efficient. If the young people – our children come home the energy drives production and change. |
| Garry Seabrook - Irrigator Coalstoun Lakes | ▪ Garry Seabrook - Irrigator Coalstoun Lakes | 12 | ▪ Stakeholder meeting (1on1 conversation) | ▪ 27 November 2019 | ▪ Generational farmers since 1946. Recognise that when Paradise Dam was built, we had wanted to bring water up to the area. We build our own 100ML on-farm storage and irrigate 126 ha but it is not reliable. But this has proven what we can do.<br>▪ The crop responds very well from a rainfall event – so the growing area is resilient. We apply 1.6ML per ha pa gives 8 tons per ha yield of peanuts. Key message – the yield average for peanuts would be 7 tons per ha with irrigation – the price paid is about $1,200 per ton. This means $8,400 revenue per ha of peanuts, using 3 ML per ha. Perfect soil and climate for peanuts.<br>▪ We are set up to grow peanuts. The struggle is succession planning and the water would help. |
| Rob Radel Irrigator | ▪ Rob Radel Irrigator | 12 | ▪ Stakeholder meeting (1on1 conversation) | ▪ 27 November 2019 | ▪ This area is on top of the catchment, so it is expensive to get water up here. But a massive advantage is that the soil is so good – and has such great drainage – that even in a cyclone (18 inches in one day) we |

| | | | | | |
|---|---|---|---|---|---|
| Coalstoun Lakes | Coalstoun Lakes | | | | are back farming four days later. Pick your least favourite child and leave them the farm. Dairy farmer – fifth generation in Coalstoun Lakes – keeps good rainfall records and this seasons have become more and more erratic.<br>▪ We just need stable water. The three issues / needs are water security and we are only 26 km from Paradise Dam. We also create jobs in this area and 9,000 ha would create massive jobs – and though it is seasonal we would have jobs 12 months of the year. The State is growing in population and we have increasing export opportunities, and this is the perfect location for market access. Has 250 acres (100 ha) and we would invest in this project. The land is tightly held and locals will buy it and not agents needed. |
| Don Roberton Irrigator Coalstoun Lakes | ▪ Don Roberton Irrigator Coalstoun Lakes | 12 | ▪ Stakeholder meeting (1on1 conversation) | ▪ 27 November 2019 | ▪ Late comers to the district – 20 years ago. Is grazing country at the top of the valley and is frost free – it lends itself to tree crops. We currently grow leukena, which doubles the production on country. Would like to grow 200 acres of fruit tree crops |
| Terry Staib Irrigator Coalstoun Lakes | ▪ Terry Staib Irrigator Coalstoun Lakes | 12 | ▪ Stakeholder meeting (1on1 conversation) | ▪ 27 November 2019 | ▪ We really need water because we only get rain every 3 to 5 years. Then we can value add to crops with intensive livestock. |
| Bill: Staib Irrigator Coalstoun Lakes | ▪ Bill: Staib Irrigator Coalstoun Lakes | 12 | ▪ Stakeholder meeting (1on1 conversation) | ▪ 27 November 2019 | ▪ There is loss of farming families due to drought over 20-30 years.<br>▪ The water would help reverse that trend and bring young people to the area. It would liven up Gayndah and Biggenden. Bill runs an earthmoving business because just farming peanuts for 31 years, but only made money a handful of years. The inputs costs are higher (diesel, tractor tyres, seed and fertiliser has tripled in cost), so the only way to combat that is water, which would double the yield to increase the revenue.<br>▪ The climate change is leading to erratic rain – all the water at once – then nothing for extended periods. |
| Cameron Rackemann Irrigator Coalstoun Lakes | ▪ Cameron Rackemann Irrigator Coalstoun Lakes | 12 | ▪ Stakeholder meeting (1on1 conversation) | ▪ 27 November 2019 | ▪ Crumpton's and Bega- PCA are both crying out for more supply. One of the reasons we get along is that we are not really competing.<br>▪ The prices for peanuts are resistant to increased production. In low production seasons the prices rise to compensate for lower production levels. The machinery and on farm drying and other equipment is all here. We have all been growing peanuts dryland for years. Only a couple of farmers have irrigation from bores. We are much better placed to grow larger levels of peanuts than Bundaberg farmers. A lot farms have invested a lot of money in contour banks / water coursing to prevent erosion and to withstand intense storms. So the water management has seen a lot of investment. There is the greatest amount of potential here. We have very little water and huge capability and great soils.<br>▪ The fairness argument is that others have got water (and want more). We have no water. Our concern is for our parents and how hard it is. |

| | | | | | |
|---|---|---|---|---|---|
| Tom Dunn (irrigator; farming persimmons and macadamias) | ▪ Tom Dunn | | ▪ Stakeholder one-on-one meetings | ▪ 17 March 2020 | ▪ Jacobs provided a summary of the progress to date on the Strategic Business Case.<br>▪ Tom farms persimmons and macadamias at his farm at 155 Crows Nest Road, Blackbutt.<br>▪ He currently has no access to external water. He uses bore water, which has worked well for persimmons. He has not had enough water from bores for the past 12 months and it resulted in his persimmon crop being low (8-9 tonnes) and the effective loss of his macadamia crop (30 tonnes at $100k).<br>▪ He would like to get 20-30ML of reliable water to allow his to invest and grow his crops.<br>▪ He irrigates from August to October. He currently grows 8-9 tonnes of persimmons on 6ML/ha of bore water. He believes that with 20-30ML of reliable water he would grow and sell: 30-40 tonnes of persimmons, 30 tonnes of macadamias and employ 6 staff (he currently has 2 staff). |
| Googa Farms | ▪ Anthony Buetel | | ▪ Stakeholder one-on-one meetings | ▪ 19 March 2020 | ▪ Jacobs provided a summary of the progress to date on the Strategic Business Case.<br>▪ Anthony indicated that he would gather together the water demand figures for the irrigators and farmers in the Blackbutt area. |
| Tony Beresford (irrigator and farmer) | ▪ Tony Beresford | | ▪ Stakeholder one-on-one meetings | ▪ 19 March 2020 | ▪ Farmer at Barkers Creek and shift superintendent at Tarong Power Station (TPS).<br>▪ His farm is 100 acres and grows loosen.<br>▪ He currently draws water from Meandu Creek that is blowdown from TPS. This water is free and is highly reliable, although the volume can vary considerably (if 7ML is less is released, the he does not receive any water).<br>▪ He holds a 7 day p/w water licence for 10ha. There is an informal arrangement between the irrigators on Meandu Creek regarding the volume and timing for extraction.<br>▪ He also uses bores, which are closely linked to the level of Meandu Creek. He has an ability to use 25ML/day, although he is currently taking 10ML/day. |
| Sharon and Mark Young (irrigator and farmer) | ▪ Sharon and Mark Young | | ▪ Stakeholder one-on-one meetings | ▪ 19 March 2020 | ▪ Jacobs provided a summary of the progress to date on the Strategic Business Case.<br>▪ Have a diverse farming mix: peanuts, silage, hay, cattle (3,000) and pigs (6,500).<br>▪ Property is 400ha, with 323ha used for irrigation and the reminder used for livestock, operations and storage.<br>▪ Annual water usage is between 200ML and 1,000ML. Currently drawing around 17ML/day from Gordonbrook but can draw a maximum of 26ML/day. Purchase 200ML/year via temporary transfer.<br>▪ Employ 4-5 permanent staff, having peaked at 17 staff.<br>▪ With greater water supply and security, they would look to generate greater security in their operations, including for succession planning in their business. Would be willing to pay up to $2,500ML for high reliability water. |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | ▪ Generally supportive of Gordonbrook Dam being converted into irrigation only, although are concerned that if the water is sold by tender process that they may be priced out of the market.<br>▪ Advised that water harvesting is limited in the area. The Youngs have started some water harvesting. |
| Crumptons | ▪ Sonie Crumpton | | ▪ Stakeholder one-on-one meetings | ▪ 19 March 2020 | ▪ Jacobs provided a summary of the progress to date on the Strategic Business Case.<br>▪ Operation processes peanuts. The target is to process 10,000 tonnes of peanuts per annum. This year is well down due to a lack of water to secure the crop.<br>▪ Source the majority of peanuts from other farms in and around Kingaroy. Also grow 1,000 acres/year, all dryland growing. Dryland growing allows for 1 tonne/acre, and wetland allows for 2 tonnes/acre. Generally it is $1,000-$2,000 per tonne.<br>▪ Of the 1,000 acres actively used for cropping only 200-300 acres is irrigated. Open to paying around $750ML, although price was given without much context of knowledge.<br>▪ Currently employs 85 people and has previously employed over 100 people. Output: 20% raw cereals; 80% blanched and roasted; small quantity of shell and grade nuts; bi-product of operations goes into feedstock.<br>▪ Supportive of changing Gordonbrook Dam to irrigators only, very supportive of Coalstoun Lakes having a water infrastructure project. |
| Chris Tunstall (irrigator and farmer) | ▪ Chris Tunstall | | ▪ Stakeholder one-on-one meetings | ▪ 19 March 2020 | ▪ Jacobs provided a summary of the progress to date on the Strategic Business Case.<br>▪ Hay product. Currently, 110 acres is being used for hay product. This could go up to 180 acres with an additional 150ML of reliable water.<br>▪ Takes around 6ML/year from Stewart Creek, plus has bores (the reliability of the bores is falling). He has a licence to take 120ML/year.<br>▪ Suggested a document for review by Jacobs. |
| Noni and Stuart Richardson | ▪ Noni and Stuart Richardson | | ▪ Stakeholder one-on-one meetings | ▪ 17 March 2020 | ▪ Jacobs provided a summary of the progress to date on the Strategic Business Case.<br>▪ Moved to Murgon township in November 2019<br>▪ Have found the urban water supply to be poor quality and unreliable. They are concerned to drink the water because they expect to become unwell.<br>▪ Only use the water for bathing and washing clothes. |
| Glenn Steinhardt | ▪ Glenn Steinhardt | | ▪ Stakeholder one-on-one meetings | ▪ 17 March 2020 | ▪ Jacobs provided a summary of the progress to date on the Strategic Business Case.<br>▪ Former irrigator and farmer in the Murgon area, and former Murgon councillor.<br>▪ Concerned regarding the over focus on environmental impacts.<br>▪ Concerned that Gordonbrook Dam needs to be carefully managed because if too much water is removed it will have problems. |

| Community groups | | | | | |
|---|---|---|---|---|---|
| Barker Barambah IAC | ▪ Stuart Nicholson | 6 | ▪ Stakeholder meeting<br>▪ One on one meeting | ▪ 9 December 2019<br>▪ 17 March 2020 | ▪ Update on the project and progress to date, including support of the project going forward.<br>▪ Plenty of interested in greater water access. Especially around Barlil Weir.<br>▪ Will continue to consult throughout the business case process.<br>▪ Suggested that the study look to put storage onto Barambah Creek, although the Barambah Gorge is not viable due to environmental concerns.<br>▪ He has a number of previous studies that he would like to provide to contribute to the project.<br>▪ Suggested that the project should look at multiple different storages. |
| Public Consultation – South Burnett | ▪ Keith Campbell, Mayor of SBRC<br>▪ Aaron Meehan<br>▪ Kristy Champney<br>▪ Ged Brennan | 6 | ▪ Public Consultation Meeting Kingaroy | ▪ 12 February 2020 | Mayoral Introduction<br>▪ Introduction and Welcome- outlined the further consultation dates in March and provided location details.<br>▪ The feasibility study will provide recommendations on how we can progress the projects/initiatives forward.<br>▪ Emphasised this is an excellent opportunity for the region. This is not just about water it is bigger than that.<br>▪ There is a primary focus on agriculture and businesses. Swickers, processing and Stanwell. They will all be consulted with and involved in the project. New industries could also arise through the security and supply of water.<br>There is also an urban component to this study in the South Burnett, so everyone is impacted. It is important to get involved.<br>Jacobs Presentation<br>Jacobs ran through the slides and discussed the project. This was facilitated by Matt Bradbury and Chris Hewitt.<br>Audience member questions (Q&A)<br>▪ At the blackbutt end there are also irrigators that sit in the Toowoomba Regional Council area. Should they still come to meetings in March?<br>▪ To what extent is the ROP considered in regard to the potential changes with Paradise dam?<br>▪ Water quality in the region is starting to have an impact on the businesses and is determinantal to the quality of the pipes. If this is improved it allows for further investment.<br>▪ Claude Wharton Weir was raised. Community members outlined when levels get low the rock formation causes issues with water quality.<br>▪ Don't forget sustainability of the community as a whole. Maintaining the current workforce is really important. Diversity is the key. |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | ▪ Amenities (football fields – all these things get impacted by drought and low water availability. We are watching people leaving. No one wants to live in a dry dead barren town.<br>▪ Has there been discussion around the extra allocation that may be available at Paradise Dam?<br>▪ What is the conversation around stage 2 of the Boondooma Dam? The land has already been acquired. This should be on the short list'<br>▪ We are currently having rain and the urgency of this in the community will lower. However, this shouldn't die we need to keep pushing forward regardless.<br>▪ There is always a big push when there is no water around. We as a community need to remain on the front foot with this opportunity.<br>▪ What stage of the business case process does international market demand and access come into consideration? I know in the Rookwood weir business case this was considered.<br>▪ For example: currently not many producers are growing peanuts as chickpeas are going through the roof in the export market. When does this analysis start?<br>▪ You should be looking for people/producers who don't use water currently but would if it was available.<br>▪ Plenty of interested in greater water access. The Chamber of Commerce in Kingaroy has lots of contacts and information that they would be willing to provide for the study.<br>▪ Any consideration on the Bundaberg area and how that has changed from Sugarcane to tree crops. This should mean that they don't need the same amount of water moving forward (in regard to the potential lowering of paradise dam and who gets the water)<br>▪ Blackbutt – There is a lot of opportunity. Wivenhoe and other pipeline run past area. Lots of High value agriculture (avocados, beans). |

Jacobs

Challenging today.
Reinventing tomorrow.

www.jacobs.com